MONOGRAPH

ON

TANNING AND WORKING IN LEATHER

IN THE

MADRAS PRESIDENCY.

BY

ALFRED CHATTERTON,

PROFESSOR OF ENGINEERING ON SPECIAL DUTY.

MADRAS:

PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1904.

XXIV

128

A MONOGRAPH ON TANNING AND WORKING IN LEATHER IN THE MADRAS PRESIDENCY.

CHAPTER I.

HISTORY.

It is difficult now to obtain any information regarding tanning and leather-working when they were purely indigenous industries. Trichinopoly is said to have been a great centre of the tanning trade and from thence large numbers of sandals and shoes were sent out to various parts of the country. If we may judge by what is now done in remote districts where the village tanner is still uninfluenced by modern methods of procedure, it is probable that the indigenous industry was in an extremely primitive condition and that only very inferior kinds of leather were produced. Nevertheless, tanneries of considerable size must have existed to supply harness and saddlery for the enormous number of irregular troops and retainers which were kept under arms by the numerous Rajahs, Zamindars and petty chieftains, who formerly exercised more or less independent sovereign powers throughout the country. The requirements of the civil population were probably small and confined chiefly to leather-thongs and ropes for the harness of draft cattle, to water bags for the country mhote, and to vessels for holding oil and ghee.

The European methods of tanning hides were first introduced by the military authorities who established a tannery at Hoonsur for the purpose of manufacturing superior leather suitable for harness and other military equipment. Contemporaneously, a French Eurasian of Pondicherry named Charles de Susa introduced improvements in the native methods of preparing skins. He is said to have visited the Isle de Bourbon or Mauritius sometime in the forties and to have there acquired a practical knowledge of the French processes of tanning. On his return to Pondicherry about the end of the forties he started a tannery there and a little later he came to Madras to set up several small tanneries, the products of which were probably exported to England. At that date the supply of both hides and skins was greatly in excess of the demand and from the Trade Returns of 1846 it would appear that the raw hides exported from Madras were of the average value of 7 annas 8 pies each, whilst the raw skins were worth 3 annas 2 pies each. These were probably selected hides and skins as the value of the exported tanned goods was even less. The tale is told that when De Susa first came to Madras he made a contract with a Muhamadan tanner to supply him with goat skins for a number of years at

Rs. 14 per 100. The skin dealer thought he had made a remarkably good bargain but eventually as the result of De Susa's enterprise, the price of skins rose so rapidly that being compelled to adhere to his contract he was soon ruined. De Susa introduced many important improvements in the native processes of tanning and he was probably the first tanner in this Presidency who succeeded in producing skins which on exposure to the air showed no tendency to that fawn red discolourisation which was previously one of the distinguishing features of country-tanned leathers. This important improvement was effected by immersing the tanned skins in a bath of myrabolams for two or three days after the ordinary tanning had been completed. With raw materials at such an exceedingly low price, with cheap labour, and with the comparatively small capital outlay which was necessary to establish a tannery, it is not surprising that the vastly improved tanned skins found a ready market in Europe and that the export trade which he started grew rapidly to considerable dimensions. Following De Susa this new tanning trade was at first largely in the hands of Eurasians but their lack of energy, improvidence and inferior business capacity enabled Muhammadan and native tanners to cut them out, so that at the present day there is scarcely a single tannery in this Presidency worked by Eurasians.

In the Report of the Madras Exhibition of 1855 it is stated—

"The manufacture of leather in this Presidency is by no means so thriving as it might be, considering the great abundance of tanning materials at command. This is probably owing to the very low rank of the artisans, for the art of leather production is well understood and successfully practised by the European tanners at Pondicherry, Hoonsur, Guntur, Bangalore and Madras, the leather being scarcely inferior to that made in Europe. Goat skins, sheep skins, buffalo and bullock hides are much used and are generally procurable but are very badly dressed; currying the leather being the province of the shoemaker's wife, while manufacturing it for the market belongs to the husband. Inferiority of Indian leather may be ascribed to want of skill on the part of the currier and to the use of quicklime."

The following remarks of the Jury on Class 16 which included leather, saddlery, harness, skins for feathers and hair, are also of interest :—

"The tanned hides and skins exhibited are nearly all of excellent quality and will bear comparison satisfactorily with the same kinds of leather prepared in Europe. They have been thoroughly saturated with tanning materials, are free from animal odour, and their sections do not show the white line between the outer and inner surfaces, indicative, in bad leathers, of a hasty and imperfect imbibition of the tanned liquor. The collection comprises the tanned hides of bison, sambur, bullock, horse, cow, goat, kid, dog and iguana. The last is the only kind requiring any special mention here, as all the others are well-known articles of trade and commerce. The iguana skins which have been tanned and dyed black or left of their natural colour, are thin, even, soft, tough, elastic, granular or shagreen-like in external appearance. From the absence of gloss the appearance of this leather is not much in its favour but it bids fair to be a durable article for light slippers and a good covering for the commoner kinds of instrument boxes such as are still done over with shagreen.

"*Tanned and coloured skins.*—Skins coloured and uncoloured for book-binding purposes and book linings are generally even, soft and pliant

and very suitable for their intended uses. Some of these coloured leathers are very brilliant. Sheep and goat skins, tanned white, are exhibited here in much perfection. None of the specimens are fine enough for the better kinds of gloves but they are all as well suited as European skins of the kind for the purpose of the apothecary.

"*Wash leather.*—The skins prepared with oil in imitation of chamois or wash leather are all excellent specimens of the kind so far as thickness, softness, pliancy and colour are concerned. In all these respects they will bear comparison with the European article, but as every one of these leathers is tainted with the odour of the fish oil employed in their preparation they cannot be recommended for household purposes such as cleaning plate, though they will be found very suitable for cleaning brasses and harness."

A second Industrial Exhibition was held in Madras only two years later and the Jury on leather then reported as follows:—

"At a moment when the manufactures of this Presidency are in a transition state, passing from the old unaided manual labour system to all the great advantages conferred by the introduction of steam machinery it seems imperative that one of the most important should not be overlooked. The manufacture of leather in this Presidency, whether regarded with reference to the requirements of the public service or from a commercial point of view, is scarcely second to any other manufacture, either in extent or importance. But, before entering on the question of tanning, it may not be uninteresting or uninstructive to submit a brief sketch of the exports of hides and tanning substances, shipped at Madras for the last three years. Commencing with the years 1853–1854, the number of untanned hides exported chiefly to England, Holland and France, was 236,876 with a money value of Rs. 1,33,295; in the years 1854–1855 there were shipments of 2,495,465 hides with a value of Rs. 6,42,035; and in 1855–1856 the exports were 1,238,079 hides valued at Rs. 3,71,736; exhibiting a total number of hides, exported during the last 3½ years, of no fewer than 6,003 086, of the estimated value of Rs. 24,71,379. It has been before observed that the largest exports have been made to England, Holland and France, and to these may be added, Arabia, the Persian Gulf, the Indian French Ports, Sind; and, strange as it may appear, to Bengal for re-shipment to North America. Looking into these facts it is unquestionable that this Presidency possesses within itself the most ample means for meeting its requirements so far as the supply of raw hides is involved; and in concluding these remarks one very striking fact may be added, that the declared value of the hides exported from Madras during the month of February last (1857) reached the very large amount of Rs. 2,04,996."

From the same report we learn that the jury of 1857 did not take so favourable a view of the condition of the industry as was done at the previous exhibition, for they state that "of the tanned hides and skins exhibited, although several of the specimens are of a very satisfactory quality, it is unquestionable that the manufacture of leather in the Presidency is still capable of great improvement and development." At that date the leading tannery in the Presidency appears to have been maintained by the military authorities at Hoonsur, closely followed however by the Horse Artillery tannery at Bangalore and the Body Guard Pits in Madras. A list of the exhibitors who obtained awards at one or other of these two exhibitions, includes probably all the more important tanners in the Presidency and amongst them we find the names of Mr. Crowe of Madras, Narasingadu of Ellore, Kullappa of Bellary, Rungacharlu at Saidapet, Chingleput

and Pallavaram, Veeraswamy Mudaliyar of Palghat, Meerapillai Labbai of Chingleput and Kasi Rao of Salem.

I have been unable to trace in detail the subsequent history of the leather trade in this Presidency. But from the information given in the statistical tables appended to this chapter it will be seen that the industry continued to steadily develope till nearly the middle of the seventies, when various causes operating at the same time led to a very rapid expansion. Up till that date the skins were consigned to dealers in England who disposed of them privately, but then, a change was made and public auctions were established. The conclusion of the Franco-Prussian War was followed by great activity on the part of Germany and about 1875 German tanners commenced buying East Indian skins in large quantities. Further in August of that year the export duty of 3 per cent. on skins was repealed; and, followed, as this was, almost immediately by the great famine of 1876–1877, which was attended with immense mortality among the livestock, an enormous expansion in the export trade in hides and skins took place and has ever since been maintained. Lastly, and perhaps of the greatest importance, was the completion of the main trunk lines of railways which enabled the Madras tanners to obtain supplies of raw materials from greatly extended areas.

From all the great sea-ports of India—Calcutta, Bombay, Madras, Karachee and Rangoon—there is a considerable export trade in hides and skins, but it is only from Madras and Bombay, and chiefly from the former, that these articles are sent out of the country in a partly manufactured state. As regards Madras, the exports of raw hides have always been very small and previous to the year 1899 there were no exports of raw skins but in the latter part of that year the export of raw skins commenced on a very large scale and still continues, although there has been a considerable falling off from the enormous exports of 1901. The demand for raw skins comes mainly from America where they are converted into leather by the chrome process. The greater proportion of the skins are dry salted but some are unhaired and pickled before they leave Madras. At the present time tanned hides are exported in a half manufactured state to be retanned and curried by the leather manufacturers of England. The direct exports to America and the Continent are comparatively small. Although so far there has been no material change in the condition of this trade, it is not improbable that the causes which have led to the export of raw skins in such enormous quantities during the last 4 years may also, at some later date, affect the business now carried on in Madras in tanned hides. It must be remembered that, large as the Madras business is in hides and skins, that of Calcutta is much larger and nearly the whole of the Bengal trade has always been in raw hides and skins.

The export trade from Madras in both hides and skins has never been entirely dependent upon local supplies as large numbers are brought down to Madras to be tanned, from the Punjab, the United Provinces, Central India and parts of the Bombay Presidency. It is therefore not unlikely that if the demand from Europe and America for raw materials continues to increase the total volume of exports

from Madras will decrease owing to the shipment of raw hides and skins from other and more favourably situated ports; those of the Punjab being sent to Karachee, those of the United Provinces to Calcutta, and the exports of Central India and the Bombay Presidency to Bombay. So far, there are no indications of a shrinkage in the total amount of business done through Madras and the change effected seems to be simply that skins are exported in a raw instead of a tanned condition. From the trade returns of 1902–1903 it appears that the average value of a raw hide is Rs. 3-7-8 and of a tanned hide, Rs. 3-8-0, whilst the average value of raw skins exported is Rs. 1-7-8, that of tanned skins Rs. 1-4-3.

It is obvious from these figures that the best of the raw materials are exported from the country in a raw condition and that all the rejections from the purchases of raw hides and skins are tanned before they are exported. This tendency to export all the better class hides and skins in a raw state is to be regretted as it naturally follows that the proportion of inferior tanned goods will correspondingly increase, with the result that the reputation of Madras tannages will decline. On the other hand, it must be remembered that the competition for raw materials has greatly increased and much higher prices are now obtained by the owners of cattle for hides and skins than was formerly the case, so that on the whole though the reputation of the Madras tanned goods may decline in western markets yet, the country, as a whole, probably benefits from the increased value obtained from what was formerly practically a waste product.

So far we have dealt with the export trade and a few words will suffice for the import.

Table V is extracted from the Custom House returns of the last three years, and shows that there is a small trade, chiefly with Ceylon and the Straits in raw skins and hides, which are sent here to be tanned and re-exported. The imports of dressed skins are mainly moroccos and roans for book binding and upholstery work. The tanned hides and leather are largely used for the manufacture of harness and country-made boots and shoes. It will be seen that the total value of the imports of manufactured leather in all forms does not exceed three lakhs of rupees per annum and though it is probable that Madras receives some of its imports through Bombay, yet it is evident that the whole trade is a comparatively small one and does not offer sufficient scope for private enterprise out here. Quite lately, however, several laudable attempts have been made to dress leather in Madras of sufficiently good quality to meet the local demands and to some extent these efforts have succeeded, but so far they must be regarded as preliminary experiments which may or may not be followed by more energetic efforts.

TABLE I.—*Exports by Sea from Fort St. George during* 1846-47.

—	Foreign Ports.							
	United Kingdom.		America.		Other Foreign Ports.		Total.	
	1		2		3		4	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides ...	48,212	22,483	...	...	386	425	48,598	22,908
Raw skins ...	67,845	8,545	157,500	31,500	2,490	265	227,835	40,310
Hides and leather	9,358	4,797	...	...	4,807	1,110	14,165	5,907
Skins, tanned ...	...	...	...	...	13,838	1,459	13,838	1,459

—	Home Ports.							
	Bengal.		Other Home Ports.		Total.		Grand Total.	
	5		6		7		8	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides ...	1,860	1,326	1,454	600	3,314	1,926	51,912	24,834
Raw skins ...	916,946	1,84,382	6,500	700	923,446	1,85,082	1,151,281	2,25,392
Hides and leather	1,088	218	553	235	1,641	453	15,806	6,360
Skins, tanned ...	87,441	9,808	71,310	7,308	158,751	17,116	172,589	18,575

TABLE II.—*Exports by Sea to Foreign Ports from the Madras Presidency during* 1902–1903.

	United Kingdom.		United States.		France.		Ceylon.		Belgium.		Holland.		Italy.		Natal.		Canada.	
	1		2		3		4		5		6		7		8		9	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides	13,802	46,002	240	2,178	660	2,970	3	16	...	...	...	...	...	...	...	...	...	...
Do. skins	350,285	5,03,516	2,272,050	33,85,587	35,264	47,048	...	...	3,300	4,690	1,500	1,466	608	608	216	2,255	1,800	2,700
Tanned hides	1,514,852	52,96,154	41,693	1,43,583	...	...	728	5,237	...	...	...	...	...	...	...	...	...	...
Do. skins	10,509,339	1,41,95,053	2,066,350	26,29,136	52,437	73,808	67,383	48,792	...	...	...	...	...	...	...	...	...	...
Horns...	Cwt. 2,962	1,27,955	...	...	Cwt. 123	3,058	Cwt. 7	336	Cwt. 23	650	...	...	...	...	...	...	...	..

	Germany.		British East Africa.		Egypt.		Japan.		Straits Settlements.		Turkey in Asia.		Victoria.		Grand Total.	
	10		11		12		13		14		15		16		17	
	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.	NO.	RS.
Raw hides	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14,705	51,166
Do. skins	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,665,623	39,47,870
Tanned hides	1,000	3,500	50	250	125	1,250	210	611	...	...	490	4,077	...	...	1,559,148	54,54,662
Do. skins	...	...	750	502	...	...	315,386	2,32,263	867,291	4,65,195	...	...	4,664	4,434	13,883,600	1,76,49,183
Horns...	Cwt. 168	5,528	...	...	...	...	...	...	...	...	...	...	...	...	3,283	1,37,527

Table III.—*Statement showing the quantity and value of Hides and Skins exported to Foreign ports from the Madras Presidency.*

Years.	No.	Value.
		RS.
1862-63	2,809,532	12,10,013
1863-64	3,379,837	14,78,337
1864-65	3,527,491	15,69,543
1865-66	3,470,144	15,12,484
1866-67	4,052,193	19,20,186
1867-68	4,536,672	25,57,389
1868-69	4,846,920	25,80,719
1869-70	5,619,924	30,81,953
1870-71	5,658,032	31,44,802
1871-72	7,063,495	39,99,564
1872-73	8,390,287	52,39,353
1873-74	8,265,264	52,77,500
1874-75	6,615,851	44,45,836
* 1875-76	8,987,874	1,00,84,153
1876-77	9,827,325	1,18,98,442
1877-78	10,836,074	1,46,59,521
1878-79	8,789,739	99,71,364
1879-80	9,798,727	1,06,86,846
1880-81	10,815,127	1,28,77,882
1881-82	12,562,219	1,51,31,714
1882-83	14,039,132	1,84,89,229
1883-84	13,843,419	1,74,73,379
1884-85	12,763,214	1,59,43,398
1885-86	15,090,944	1,84,02,184
1886-87	15,415,837	1,83,66,822
1887-88	17,106,984	2,07,26,638
1888-89	17,940,729	2,10,96,275
1889-90	17,196,861	2,02,33,163
1890-91	16,802,164	2,00,65,844
1891-92	18,311,652	2,24,10,229
1892-93	18,217,383	2,41,63,892
1893-94	18,343,907	2,62,24,090
1894-95	20,828,585	3,06,44,717
1895-96	21,706,892	3,32,16,926
1896-97	19,679,949	3,06,22,445
1897-98	19,111,898	3,10,61,023
1898-99	17,460,435	2,63,96,637
1899-00	19,060,768	2,89,66,104
1900-01	22,946,170	3,68,61,023
1901-02	17,933,636	2,67,68,035
1902-03	18,123,076	2,71,02,881

* Note.—I have been unable to find any satisfactory explanation for the enormous increase in the value of hides and skins which took place in 1875-76. The increase is almost 100 per cent., and, though the reasons stated on page 6 powerfully operated to raise prices, I am inclined to think that the sudden change is due in part to a different method of estimating values having been adopted when the export duty was abolished.

Table IV.

Exported to	Export.	From all India. Value.	From all India. Total value.	From Madras. Value.	From Madras. Total value.
		RS.	RS.	RS.	RS.
1899-1900.					
United Kingdom...	Raw Skins.	12,41,216		2,22,514	
Rest of Europe ...		5,25,395		18,170	
America ...		1,78,57,459	1,96,24,070	13,76,334	16,17,018
United Kingdom...	Dressed Skins.	2,04,60,621		1,40,21,307	
Rest of Europe ...		6,08,674		5,07,138	
America ...		55,31,742	2,66,01,037	55,26,753	2,00,55,198
United Kingdom...	Raw Hides.	68,63,920		......	
Rest of Europe ...		3,01,85,408		419	
America ...		1,14,15,602	4,84,64,930	......	419
United Kingdom...	Dressed Hides.	83,47,032		66,03,232	
Restof Europe ...		15,725		14,125	
America ...		1,26,235	84,88,992	1,26,235	67,43,592
	Total ...		10,31,79,029		2,84,16,227
1900-1901.					
United Kingdom...	Raw Skins.	19,88,467		3,26,259	
Rest of Europe ...		6,85,199		11,163	
America ...		1,45,37,044	1,72,10,710	16,62,701	20,00,123
United Kingdom...	Dressed Skins.	2,39,10,070		1,64,33,651	
Rest of Europe ...		1,86,682		1,42,078	
America ...		49,98,306	2,90,95,058	48,78,107	2,14,53,836
United Kingdom...	Raw Hides.	84,02,564		2,570	
Rest of Europe ...		3,38,82,357		......	
America ...		96,36,123	5,19,21,044	123	2,693
United Kingdom...	Dressed Hides.	1,41,15,454		1,20,36,404	
Rest of Europe ...		1,14,921		74,066	
America ...		2,75,262	1,45,05,637	2,74,846	1,23,85,316
	Total ...		11,27,32,449		3,58,41,968
1901-1902.					
United Kingdom...	Raw Skins.	36,58,220		7,61,318	
Rest of Europe ...		9,96,569		63,095	
America ...		2,23,11,148	2,69,65,937	51,44,230	59,68,643
United Kingdom...	Dressed Skins.	1,59,17,406		1,11,32,233	
Rest of Europe ...		48,716		37,897	
America ...		25,05,237	1,84,71,359	24,60,968	1,36,31,098
United Kingdom...	Raw Hides.	11,52,033		78,760	
Rest of Europe ...		2,10,50,006		......	
America ...		56,02,679	2,78,04,718	14,285	93,045
United Kingdom...	Dressed Hides.	74,97,133		65,93,019	
Rest of Europe ...		17,136		459	
America ...		91,600	76,05,869	91,600	66,85,078
	Total ...		8,08,47,883		2,63,77,864

TABLE IV—*cont.*

Exported to	Export.	From all India. Value.	From all India. Total value.	From Madras. Value.	From Madras. Total value.
1902–1903.		RS.	RS.	RS.	RS.
United Kingdom...	Raw Skins.	32,68,541		5,03,516	
Rest of Europe ...	Raw Skins.	12,26,591		53,812	
America ...	Raw Skins.	2,06,82,060	2,51,77,192	33,88,287	39,45,615
United Kingdom...	Dressed Skins.	1,92,29,718		1,41,95,053	
Rest of Europe ...	Dressed Skins.	81,440		73,808	
America ...	Dressed Skins.	26,29,136	2,19,40,294	26,29,136	1,68,97,997
United Kingdom...	Raw Hides.	12,86,007		46,002	
Rest of Europe ...	Raw Hides.	2,37,09,315		2,970	
America ...	Raw Hides.	37,79,602	2,87,74,924	2,178	51,150
United Kingdom...	Dressed Hides.	60,27,413		52,96,154	
Rest of Europe ...	Dressed Hides.	3,500		3,500	
America ...	Dressed Hides.	1,43,583	61,74,496	1,43,583	54,43,237
	Total ...		8,20,66,906		2,63,37,999

TABLE V.—*Imports.*

——	1900–1901.		1901–1902.		1902–1903.	
	NO.	RS.	NO.	RS.	NO.	RS.
Raw Hides	5,855	11,261	13,516	28,644	10,758	22,100
Raw Skins	175,547	2,25,967	213,948	2,79,354	222,786	3,11,184
Boots and Shoes ...	28,425	86,672	20,652	68,878	25,040	68,802
Skins (dressed or tanned.)	12,712	34,728	9,983	45,624	11,468	31,766
Hides (dressed or tanned).	10,659	44,598	9,032	29,951	13,056	57,516
Leather (unwrought)...	...	...	24	6,535	184	34,291
Saddlery and Harness .	...	9,632	...	19,501	...	33,497
Other sorts	...	899	...	65,196	...	63,951

CHAPTER II.

TANNERS AND LEATHER-WORKERS.

From the Census returns of 1901 it appears that the total number of people in the Madras Presidency who are partially or entirely dependent upon one or other branch of the tanning and leather working trades is 190,011. Of this number, 9,294 are engaged in the manufacture of leather from hides and skins; 111,865 are returned as boot, shoe and sandal makers, and 50,796 as water-bag, well-bag, bucket and ghee-pot makers; whilst of leather dyers there are apparently only 77.

The export trade and the financing of the industry is mainly in the hands of the large mercantile houses in Black Town and, at one time or other, almost all the large firms in Madras have traded in skins; of late years, however, owing to the keenness of the competition and the violent fluctuations in the prices obtained at the London auction sales, the trade has become a very speculative one and a good many European firms have dropped it. The collection of hides and skins, and the work in the tanneries is entirely in the hands of poor Muhammadans, and the old native leather workers of the country, whose social position is so extremely low that there is much dispute between them and the pariahs as to which occupies the more honored position. In the Telugu districts they are known as the Madigas, whilst in the Tamil districts they are called Chakkiliyans. The former are mainly found in the Ceded districts and the Coast districts from Nellore to Vizagapatam. They number over three-quarters of a million but many of them no longer pursue their hereditary calling. The Revd. H. Huizinga of the American Baptist Mission at Ongole has kindly furnished me with the following note:—

"The Madigas or Matangas, sons or descendants of King Matanga, are an ancient tribe, probably of Dravidian origin, inhabiting the districts of the Madras Presidency north of Madras. They are most numerous in the Nellore and Kistna districts. Traditions and certain customs indicate that at one time they occupied an independent and exalted position but for centuries they have been considered to be the veriest slaves of the Sudras and the higher castes. They are very poor, their clothing is scanty, their food is coarse and insufficient, their homes are but hovels, built in circular form of mud, with thatched roofs but without windows or frames. They live in small hamlets at a respectable distance from the villages of the caste people by whom they are greatly despised. Their habits are squalid in the extreme, and the odour of a Madiga hamlet is revolting. They perform all the lowest kinds of services for the caste people, especially bearing burdens and working in leather. They take charge of the ox or buffalo as soon as it dies. They remove the skin and tan it, and eat the loathsome carcass which makes them specially despised and renders their touch so polluting. Some of the skins are used for covering the rude drums that are so largely used in Hindu festivals and beaten in honour of the village deities. The caste men impress the Madigas into their service, not only to make the drums but also to beat them at their feasts. It may be mentioned that nearly ten per cent. of the Madigas are nominal Christians and in some parts of the Nellore district the Christians form over one half of the Madiga population. This changes their habits of life and also their social position. Eating of carrion is now forbidden as well as beating of drums at Hindu festivals and their refusal

in this particular often leads to bitter persecution at the hands of the caste people. The main duty of the Madigas is the curing and tanning of hides and the manufacturing of rude leather articles, especially sandals, trappings for bullocks and large well buckets used for irrigation. The process of tanning with lime and *tangadu* bark is rough and simple. As did their forefathers, so do they even to this day. The quality of the skins they turn out is fair and the state of the development of the native leather trade compares very favourably with that of other trades such as blacksmithy and carpentry. I think it speaks well for the intelligence and industry of the despised Madiga that he has made so much of his small opportunities. In the manufacture of leather goods the Madiga has shown not less ability. The needs of his customers have hitherto been very small but what he makes is perfectly adapted to its uses. His sandals are strong, comfortable and sometimes highly ornamental. His manner of working and his tools are as simple as his life. He often gets his pay in kind, a little fodder for his buffalo, so many measures of some cheap grain, less, if the crop should be poor, perhaps a few green vegetables, etc. It is very difficult to estimate how much the village cobbler does earn; but if he is a good workman it is at least a fair average cooly wage and possibly a little more."

In the Northern districts the Madigas are attached to one or more families of ryots and they are entitled to the dead animals of their houses. Like the Vettiyan in the south the Madiga is paid in kind and he has to supply sandals for the ryots, belts for the bulls and all the necessaries of agriculture and for these he has to find the requisite leather himself; but for larger articles such as water-buckets the master must find the leather. Of late years there is a tendency observable among Madigas to poach on each other's monopoly of certain houses and among the ryots themselves to dispense with the services of family Madigas and to resort to the open market for their necessaries. In such cases the ryots demand payment from the Madigas for the skins of their dead animals. The skins and hides that remain after local demands have been satisfied are sold to merchants from the Tamil districts and there is generally a central agent to whom the various sub-agents send their collections and by him they are dried and salted and sent to Madras for tanning.

As mentioned by Mr. Huizinga, the Madiga enjoys certain social privileges which will accord with his otherwise humble position. At every festival of the village Goddess he is entitled to blow the horn; he enjoys the privilege of canvassing the opinion of by-standers before a victim is sacrificed at the altar, he gives the word to slay it, and with his own hand cuts the victim when it is a he-buffalo. He is the repository of the traditional liplore and to him is entrusted the singing of ballads at and after the religious sacrifices. An unmarried woman of Madiga class is chosen as the Matangi and is looked upon as the representative of the goddess of that name. Her sanctifying touch and spittle are indispensable at the feast of the village goddess and are eagerly sought for by all classes other than Brahmans before a marriage or similar rejoicing is celebrated. The Madiga calls himself the child of Matangi, who was Siva's wife, and a woman of this class is, in the opinion of Sakti worshippers, a favourite abode of their goddess. In the Kistna district children have little leather strings hanging from their left shoulders like the sacred cord of the Brahmin, from which is suspended a bag containing something put in it by a Madiga to charm away all forms of disease from the infant wearer.

From the North Arcot District Manual, the following extract is taken:—

"Madigas are workers in leather, an occupation of which they had the monopoly until the Muhammadans and Labbais appeared upon the scene. Whether they or the Malas are the lowest is a subject of dispute between the two classes, but by others they are considered as about equally low, and not caste people at all, and are not therefore allowed to ascend the Tirupati hill, enter the portico of a pagoda, or walk in the streets of a Brahmin village. The Madigas will not take food or water from Pariahs, nor the latter from the former, a prejudice which is taken advantage of in the Kalahasti Raja's stables to prevent theft of gram by the Pariah horsekeepers, the raw gram being sprinkled with water by Madigas in the sight of the Pariahs. The name Madiga is said to be a corrupt form of Matanga, a descendant of the sage Matanga Muni, and according to a tradition current in the caste, the Madigas or Matangas have fallen to their present abject position owing to the curses of their ancestor Matanga Muni. There was a Matanga dynasty in the Canarese country, and the Madigas are by some believed to be the descendants of people who were once a ruling caste. Their only tradition refers to one Arundhati, a Madiga maiden, whom, they say, the rishi Agastya considered fit to be his wife. Proud of this distinction the cobblers often call themselves Arundhati's caste. They are very filthy in their habits, eat almost anything, and drink to excess. The Madigas affect to worship the Hindu gods but their favourite deity is Matangi. A widow may not remarry, but can live in concubinage without any disgrace.

"At marriages the bridegroom has to provide thirty-five new pots and a sum of Rs. 5, which is spent in drink consumed by the guests. The ceremony is performed by their own priests, for no Brahmin will approach their haunts. They are the drummers and horn-blowers of their village, their horn being called 'bankha' and their drum 'tappati,' but their main occupation is tanning and leather-working, and they usually claim the privilege of taking free of payment the hides of all animals dying in the village, and are not always above increasing the death-rate by means of poison."

In the Tamil country the place of the Madiga is taken by the Chakkiliyans of whom there are nearly half a million, resident chiefly in the districts of Salem, Coimbatore and Madura. They are apparently emigrants from the Telugu and Canarese districts as a large proportion of them speak Telugu or Canarese though living in a Tamil country; and there is not much doubt that their social position is even lower than that of the Pariahs. Nominally they are Saivites, but in reality devil worshippers. The *Avaram* plant is held in much veneration by them and the *tali* is tied to a branch of it as a preliminary to marriage. Their women are considered to be very beautiful and their widows may remarry. They indulge very freely in intoxicating liquors and will eat any flesh, including beef and pork. The position of the Chakkiliyan in the south differs greatly from that of the Madiga in the North and many of his privileges are enjoyed by a sub-sect of the pariahs called Vettiyans. These people possess the right of removing dead cattle from villages and in return have to supply leather for agricultural purposes. The majority of Chakkiliyans are not tanners but leather workers, and instead of getting the hides or skins direct from the Vettiyan they prefer to purchase them ready-tanned from traders who bring them from the large tanning centres. The village chuckler earns about 3 or 4 annas a day. In towns he either

works for himself or is engaged by dealers in sandals and shoes and gets from 4 to 6 annas a day as wages. The cleverer among them are employed as maistries and earn from 8 to 10 annas a day.

Persons other than chucklers engaged in leather-work.—In nearly every district of the Presidency are to be found representatives of a Mahratta caste of painters and leather-workers who are very numerous in the Bombay Presidency. These are the muchis who at the last census numbered 5,804. They claim to be Kshatriyas, wear threads and have Brahmin priests. These pretensions are not admitted on the Bombay side where the Muchis occupy a very low position in the social scale although they are considered superior to outcastes. The muchi is not a tanner and as a leather-worker only engages in the higher branches of the trade. Some of them make shoes but draw the line at sandals; others are harness makers and are called Jinigarus; whilst a considerable number are engaged as menial servants in Government offices. Throughout the country nearly every office has its own Muchi whose principal duty is to keep in order the supplies of stationery and from raw materials manufacture ink, envelopes and covers and generally make themselves useful. A good many of the so-called muchis, however, do not belong to the caste as very few have wandered south of Madras and they are mostly to be found in Ganjám and the Ceded Districts.

In the Malabar district the trade in raw hides and skins is chiefly in the hands of Mappillas. They are not tanned in the district but are exported largely to Ambur and Vellore. Weekly fairs are held at several places in the district and all the available hides and skins are put up for sale and are purchased by Muhammadans. In this district besides chucklers there are three other castes, also engaged in leather work :

(1) *Thole-Perunkollans* (*literally, leathersmiths*).—These are blacksmiths by caste who abandoned their hereditary trade for leather work and they are chiefly employed by Mappillas. One peculiar custom in this caste is that two or more brothers may have one wife in common. Only those in good circumstances indulge in the luxury of a private wife.

(2) *Mappillas.*—These are Malayalam-speaking Mussulmans, either of mixed descent or converts to Islam. Some of them have taken to leather working and they are considered to be specialists in the making of ceruppus or leather shoes.

(3) *Panans,* who are supposed to be the descendants of a hill tribe who had settled in the plains. They are exorcists and devil dancers and their chief occupation as leather-workers is in the manufacture of drum-heads.

From the foregoing accounts of the various classes engaged in the leather trade it will be seen that they are entirely confined to the lowest classes of the community; and before any material improvements can be introduced into the processes by which leather is now manufactured, it will be necessary either to educate these degraded classes or induce more intelligent workmen to enter tanneries. The number of people engaged in actual tanning is comparatively small and in good seasons there is often great difficulty in obtaining a sufficient number

of men to carry on operations. Most of the actual workmen in tanneries are also agriculturalists or do cooly work for the ryots; and in good seasons when work is plentiful and food cheap, they can only be induced to work in tanneries by the offer of comparatively high wages. The opinion is generally held among the merchants of Madras engaged in the export trade that no improvements can be effected in the tanning processes now in use because of the difficulty of getting workmen sufficiently skilled and intelligent to carry them out. But this is scarcely borne out by the history of the trade as during the last three-quarters of a century great improvements have been effected in the methods of tanning and the quality of the outturn. Although the tanners and the leather-workers are the lowest of the low, yet they are not deficient in intelligence and there is but little doubt that if the enterprise were forthcoming, which is necessary, to start modern methods of tanning there would be little difficulty in obtaining, after a short time a sufficient amount of labour skilled enough for the work.

CHAPTER III.

HIDES AND SKINS.

The tanning trade in the Madras Presidency is by no means solely dependent upon local supplies of either hides or skins. Large quantities of hides are sent down from Calcutta and fairly large supplies are received from the Nizam's Dominions and parts of the Bombay Presidency. The area from which skins are drawn is even larger, and extends as far north as Amritsar in the Punjab, whilst supplies are received by sea from Ceylon and the Straits Settlements. Indian hides are, as a rule, of inferior quality and the bulk of them are small. The number exported from India either in a tanned or raw condition, is large enough to form an important branch of the leather trade in Europe and America, where they are known as East India kips and are largely used for upper leathers Large hides are usually retained in the country for local consumption as, if they are in good condition better prices can be obtained for them than on a market where unusual sizes are not looked for. In the trade, hides are classified under the terms 'cow' and 'buffalo', whilst those below a certain weight are termed 'calf'. The inferiority of Indian hides is in part due to the poorness of the cattle and in part due to the fact that they are heavily branded and as many of them are used for draft work their hides show signs of wear and tear. Except in large towns and more especially in cantonments, cattle are never killed for food and the only hides available are those taken off animals which have died from disease, old age or injury. The slaughter-house hides are those obtained from cattle which have been fattened up for killing, are usually of good quality and, in the case of cow hides, might well be used for making sole-leather but their number is so small that the whole Presidency could hardly supply enough to keep one tannery going. Hindus are very averse to killing animals and they allow their cattle to linger on in sickness and old age when it would be kindness to the poor beasts to

put an end to them. The animals suffer and naturally their skin deteriorates. But the most fruitful source of injury is the merciless way in which cattle are branded. The branding process is carried to such an extreme that many thousands of hides are absolutely ruined and a very large number are depreciated 50 per cent. in value through branding which is either done to satisfy the owner's aesthetic eye or calm his troubled mind. Branding is supposed to be efficacious in keeping away evil spirits and preventing disease. It is also largely resorted to as a remedy for many diseases especially anything in the nature of staggers or fits. Now that hides have a very distinct market value and are easily disposed of, a man's cattle are always liable to be killed simply for the sake of the hides and there is no doubt that branding cattle and thereby rendering their hides of little value is an efficacious way of insuring them against the poison of the sneaking Vettiyan.

An examination of the tables appended to Chapter I shows that, whilst, from other parts of India, nearly all the hides are exported in a raw condition, in the Madras Presidency the reverse is the case and here the exports of raw hides are of little practical importance. Small hide tanneries are to be found in nearly every district of the Presidency but the great bulk of the trade is concentrated round Madras, at Bangalore, Vellore, Dindigul, Coimbatore and Trichinopoly. Fresh hides from the slaughter-houses are of importance only in Bangalore and Madras and the numbers available for the last five years will be found in Table I appended to this Chapter. The majority of hides obtained in this Presidency are received by the tanners in a wet salted condition, whilst those which come from more distant places are mainly flint-dried. The bulk of the latter are what are known in the trade as 'Calcutta rejections' and are invariably more or less damaged.

The local demand for leather, although small compared with the population, is, in the aggregate, of very large amount. As regards the export trade, elaborate statistics are available, but nothing is accurately known regarding the internal trade and it is only possible to estimate it roughly by very indirect methods. The Census Returns show that there are more than 150,000 people engaged in the manufacture of leather goods; and if we assume that on an average they earn about 3 annas a day their total annual income will exceed one crore of rupees. How much leather they actually use can only be guessed at, but if we assume that its value is not more than double that of their wages, we shall certainly not overestimate it, and on this assumption we arrive at the result that at least two crores of rupees worth of leather is used in this Presidency. Buffalo hides are mainly used for sandals, soles of shoes, harness and probably ropes, whilst the main demand for cow hides is to supply the ryots with the water bags or mhotes with which they lift water from wells for the irrigation of their fields. From the information which is available regarding the number of wells used for irrigation, it is almost certain that over a million hides per annum are consumed in this one branch of the industry.

Although the export of tanned hides from Madras is very large, yet, if we exclude those which come to the Madras tanneries from other Presidencies, it will be evident that only a comparatively small

proportion of the local supply of hides is available for export and that by far the greater number are required for local use. Hides for export are classified as 2nds, 3rds, 4ths, and 5ths or rejections. There are no 1sts as it is seldom that hides of sufficiently good quality can be obtained. In making up a parcel of 100 hides the trade requires that there should be about 30 2nds, 40 3rds, 25 4ths and 5 5ths. The 2nds are practically sound hides; the 3rds are slightly defective and have usually small brands of holes on one side only; in the 4ths defects are numerous and they are generally branded on both sides; whilst the 5ths may possess all kinds of defects and are always very badly branded. Hides, in the trade, are known by the name of the place at which they are tanned, and the best hides exported from Madras come from Secunderabad, Bangalore and Ranipet. Hides naturally vary in weight very considerably, but the bulk of those exported are only from 6½ to 9 lbs. in weight and their value from As. 10-6 to As. 11-6 per lb. Buffalo hides are usually much heavier than cow hides, but the leather is of inferior quality, being loose and spongy, and it fetches a much lower price, the average rate being about As. 8 a lb. Hides vary very much in quality depending upon the nature of the season, and in famine years when the number thrown on the market is abnormally large they are always of inferior quality. Hides are generally in the best condition when there is plenty of grass available and, as a general rule, the best hides reach Madras for export in December and January. After the rains the yield of leather from hides decreases by from ½ to 1 lb. and the tanners attribute this to some change in the quality of the water; but as it is to this cause that nearly everything is attributed which is inexplicable to them, it is probably not correct, and it is far more likely to be due to changes in the physiological condition of the hide, consequent upon the better feeding which the animals get when there is plenty of grass.

Skins.—The skin trade in the Madras Presidency is a very important one and, as the local consumption of tanned skins is much less than that of tanned hides, a much larger proportion of the total yield of skins in the Presidency is available for export.

The term 'skins' is technically only applied to pelts of sheep and goats. Goat skins are larger, heavier and of much better texture than sheep skins. Unlike hides the majority of skins are derived from animals which have been slaughtered for food and the pelts are therefore in much better condition and will compare favourably with similar classes of skins from other parts of the world. The tanning of skins is confined to Bombay and Madras and the bulk of the business is done in the latter Presidency. East India skins are in very large demand in Europe and America and for many years past, with temporary fluctuations, there has been a steady rise in their value. Besides local supplies, the Madras tanners receive large numbers from other parts of India; and from such centres as Cawnpore, Agra, Delhi, Amritsar, Sholapur, Amraoti, Hyderabad and Poona, many thousands of skins are sent down by rail every year. The quality of skins varies very much with the season of the year but unlike hides, they are generally at their worst during the rainy weather. Goat skins are usually in good condition from February to the middle of September and sheep skins from March to about the same date. During the rainy season

the animals become feverish through exposure and the effect shows in the pelts. The hair grows long on account of the cold and this leads to loss of tissue, with the result that the pelt is thin and papery. During cold weather *puripuri* is very common among the flocks and this, when serious, greatly diminishes the value of the skins and renders them unfit, after tanning, for anything in the nature of first-class work. Buyers of raw skins for export generally cease operations during the cold weather.

The majority of the dried skins, which during the last few years have been exported from Madras, are for chrome tanners in America. Skins tanned by the chrome process do not gain substance in the same way as in vegetable tanning, and plump well-nurtured skins are therefore in great demand by chrome tanners. The bulk of the Madras skins exported to America are converted into glacé kid and the demand is for large skins. Anything less than a spread of 75 square feet per dozen skins is regarded as unsatisfactory. Moreover, every skin should be at least 21 inches wide so that when converted into glacé kid it may be possible to cut two sets of "upper sides" from each skin.

The export merchants are mostly men who formerly, or even now, continue to run tanneries and they have set up curing yards outside their tanneries. A large open piece of land is all that is required and the surface is just dressed over with mud. The skins on arrival are carefully sorted—those damaged or too small are rejected; those considered good enough for export are stretched out on the ground and pegged down with iron nails, flesh side uppermost. The skin is then rubbed with a saturated solution of sulphate of soda and allowed to dry. The process may be repeated a second time, after which the skins are packed in bales and sent to the godowns of the shipping merchants. The sulphate of soda is obtained from the United Provinces where it occurs in local deposits. The rejected skins are tanned and exported, many of them going to Singapore.

A skin expert in Madras who buys largely for export, classifies goat skins according to the districts from which they come as follows:—

(1) Madras town, with its local supply of slaughter-house skins from neighbouring districts.

(2) Northern Circars; from Nellore, Nandyal, Bezwada, Cocanada, Vizianagaram and Berhampore.

(3) Ceded districts, along the Madras Railway from Adóni to Raichur.

(4) Hyderabad, with Secunderabad as the centre.

(5) Bangalore, from Jalarpet to Mysore.

(6) Coimbatore, from Salem to Calicut.

(7) Trichinopoly, from Tanjore southwards, including the whole country served by the South Indian Railway.

(8) The Deccan, extending from Sholapur to Bombay and from Manmad in the north to Darwar in the south.

(9) Central Provinces.

Each of these districts produces a different kind of skin and with features so strongly marked that they easily enable an expert to distinguish the skins of one district from another. As regards quality those from Coimbatore and Trichinopoly are far the best. Next to them come the skins from Bangalore, Hyderabad and the Deccan, whilst inferior to them are the skins from Madras, the Ceded districts and the Northern Circars. Lastly come the skins from the Central Provinces which are inferior to all the others. This classification, it must be remembered, is from the point of view of an exporter of dried skins and he naturally regards them entirely from the chrome tanner's point of view, which probably differs slightly from that of the vegetable tanner. Both require skins with a good grain but plumpness and a firm texture are of greater importance to the chrome tanner. On the London market Madras slaughter-house skins take the first place, although in this classification they are placed very low down, the reason being that although the skins are of no great value for chrome tanning, yet, owing to the care with which they are tanned and the excellence of the grain, they are well suited for conversion into highly finished book-binding leathers.

Sheep skins.—There are three kinds of sheep available in the country; (1) wool sheep, (2) hair sheep, (3) short-hair sheep. The wool sheep form the majority. Their skins are spongy and loose and are of no great value. Out of the 9 districts already mentioned, hair sheep are only found in five—Madras, the Northern Circars, the Ceded districts, Coimbatore and Trichinopoly; and even in these districts there are a considerable number of wool sheep. The short hair sheep are only found in the Trichinopoly district and they yield a very plump leather which in its finished state is comparable with that of tanned goat skins.

The majority of skins are received in the tanneries in a wet salted condition but in large towns like Madras, Trichinopoly and Bangalore, a large number of slaughter-house skins are always available. The price of skins varies according to their size and condition. Goat skins are worth from Rs. 120 to Rs. 200 per 100 and average probably not less than Rs. 150. Sheep skins are much smaller, weigh less, and fetch a smaller price per lb. One hundred goat skins will weigh about 80 lbs. and 100 sheep skins about 55 lbs. The average value of 100 sheep skins is about Rs. 70.

Besides the hides and skins of what we may term 'domestic animals,' the Presidency yields a considerable number of skins of wild animals, the majority of which are exported. Deer skins are by far the most numerous but there are occasionally consignments of the skins of almost all the wild animals found in the Presidency. Amongst them may be mentioned elephants, tigers and leopards; but in the aggregate they are of no commercial importance. Deer skin is considered by Hindus an emblem of purity and it is on that account specially valued by Brahmins. The orthodox Brahmin uses the deer skin for his seat when he offers prayers to God. Such skins are never unhaired and are preserved from decay by being dressed on the flesh side with a mixture of alum and salt. Such skins are also used for making bags and small cases in which Hindus keep the white, yellow and red paints they use for making their caste marks. Tiger skins

are regarded with some sanctity and are chiefly used by the yogis and ascetics.

The following table shows the number of sheep, cattle and pigs slaughtered during the last five years within the Municipalities of Madras and Bangalore. The information is interesting as showing that a comparatively small number of animals are used for food in India :—

Year.		Number of sheep and goats slaughtered.	Number of cattle slaughtered (cows, buffaloes, oxen, &c.)	Number of pigs slaughtered.
1898–1899 ...	Madras	343,220	8,518	619
	Bangalore	113,967	18,402	725
1899–1900 ...	Madras	342,856	10,412	977
	Bangalore	131,406	21,012	756
1900–1901 ...	Madras	349,058	11,475	1,135
	Bangalore	129,369	19,963	701
1901–1902 ...	Madras	343,370	13,474	1,023
	Bangalore	118,515	18,609	714
1902–1903 ...	Madras	342,222	16,212	1,833
	Bangalore	138,760	19,389	604

CHAPTER IV.

TANNING MATERIALS.

We have already seen that the tanning industry in this Presidency owes its extensive development to the cheapness and the excellent quality of the raw materials used in the tanning pits. Avaram bark (*Cassia auriculata*) and myrabolams (*Terminalia chebula*) are almost exclusively employed in the tanneries whose products are chiefly for export; but the local tanners often get their supplies from other sources and the investigations of the Forest Department show that there are in the forests and on the waste lands a very large number of trees and shrubs which are capable of yielding tannin in sufficient quantities to be of practical importance. The Conservator of Forests in the Northern Circle has furnished me with a list of no less than 70 tannin-yielding shrubs and trees and such information as is available regarding the majority of these is to be found in the Agricultural Ledger No. I of 1902, by Mr. D. Hooper which contains a useful summary of the information regarding the raw

stuffs of India, which contain tannin. The Madras Forest Department derive a revenue of considerably over a lakh of rupees from the sale of the right of collecting tannin-yielding materials. The supply is apparently enormously greater than the demand although the latter is by no means inconsiderable. The only tannin materials which are exported are myrabolams from Cocanada and the ports on the Vizagapatam Coast, and Cutch, of which every year a few tons are sent from Negapatam. The export of myrabolams varies between 6,000 and 7,000 tons per annum and is of a value of about three lakhs of rupees.

The demand for tannin in Europe and America in the leather and dyeing industries is enormous and it is difficult to say, with the exception of myrabolams, why India has been unable to establish an export trade in this direction. A good deal of work has been done by Sir George Watt, the Reporter on Economic Products in this country, and by the Research Department of the Imperial Institute in London, to ascertain the value of the various Indian tanned stuffs and to make known the results of their enquiries. A considerable amount of information has been published in various numbers of the Agricultural Ledger and in papers which have been contributed to Trade Journals in Europe and America. Hitherto, however, the results have been unsatisfactory. This is probably mainly due to the fact that no serious efforts have ever been made to introduce Indian tanned stuffs to the European markets. The following extract from Mr. Hooper's paper already referred to may be quoted as a typical instance :—

"The Australian Acacias or wattles introduced into the Nilgiri Hills many years ago, have firmly established themselves, but nothing seems to be done as in Australia in collecting the bark as a commercial article . . . . The price of wattle bark is £10 per ton in English market and the market is supplied exclusively form Australia. A sample of bark from some *Acacia decurrens* grown on the Nilgiris was forwarded a few years ago to London for valuation. The reply stated that the sample of bark was in good condition and rich in tannin. But as buyers were in the habit of procuring their bark from a certain country in regular quantities there would be a prejudice in receiving it from a new source such as the East Indies, and there is nothing to guarantee their receiving a regular supply of the same quality. Tanners do not like to change the materials they employ, and English and Continental firms, after obtaining wattle barks from the Australian Colonies for nearly a century, are apt to look with suspicion upon other wattle barks . . . . Extracts have been made from these barks, preparations which hold the virtues in a concentrated form, and much better than the crude bark for exporting. There is a good market in Europe for well prepared wattle bark extract and the demand has been on the increase during the last few years."

No effort seems to have been made to ascertain what quantity of wattle bark could be procured in the Nilgiris annually and, without such information, it is hopeless to expect that private enterprise will make any effort to bring this source of tannin on the market. Government, as owners of the forests, and consequently of all the principal sources of supply of raw material, are most interested in this question; and it can hardly be doubted that if the Forest Department were to make a serious effort to place the Indian tans on the European and American markets, it would lead to

considerable commercial success. The percentage of tannin contained in most raw materials is comparatively small, and for any commercial development it is absolutely necessary that the tannin should be extracted from the raw material and sent home in a dry state in the most concentrated form possible. Tannin is readily soluble in water but the evaporation of the extracts to dryness is attended with considerable difficulty as the concentration must take place at a low temperature. To raise the liquid extract to anything approaching the boiling point of water would lead to the decomposition of the tannin and the formation of useless compounds. The extracts must, therefore, be evaporated in vacuum pans. Even for experimental work such apparatus requires considerable capital outlay. It seems to me, however, that the difficulty might possibly be got over by evaporating the liquid extracts to dryness in shallow tanks somewhat in the same way as salt is extracted from the sea water in salt pans all round the coast of India. From February till June there will be little difficulty in carrying on such operations in the open air and if the prolonged exposure to sunlight does not affect the composition of the tannin, it is possible that in this method we may find a solution of the problem of cheaply preparing extracts of tannin from some of the more important tannin-yielding plants. Experiments in this direction will cost very little and I have arranged to have them carried out in Madras in connection with the chrome tanning trials which are now being made under my supervision at the School of Arts.*

Short notes on the more important sources of tannin in this Presidency are appended:—

(1) **Cassia Auriculata** (*Tam.* Avarai; *Tel.* Tangedu; *Hind.* Tarwar).—This is by far the most important source of tannin in the south of India and the bark contains from 10 to 20 per cent. of tannin, 12 per cent. being perhaps a fair average to take. This shrub is to be found in nearly all the districts of the Presidency; and the leasing of the right of collecting the bark is a source of considerable revenue to the Forest Department. The tannin yielded by this bark belongs to the catechol group and gives a greenish precipitate with ferric salts. Leather tanned with it is of a pale yellow colour but on exposure to sunlight it turns red. This defect is remedied by immersing the tanned skins in a bath of myrabolam extract.

The researches of the Committee of the Society of Arts on the decay of book-binding leathers showed that all catechol tannages are peculiarly liable to destruction by the action of sunlight, dry heat, gas fumes and traces of sulphuric acid from other sources, although in many cases more durable than the pyrogallol tannages, when exposed to mechanical wear and moisture, as is the case with shoe leather. This is peculiarly unfortunate as the greater part of the Madras prime tannages are purchased in Europe for conversion into book-binding leathers. The price of the bark fluctuates considerably and averages in Madras about Rs. 15 per candy of 500 lbs. or Rs. 67–8–0 a ton. For the tannage of skins it seems eminently suited,

---

* *Vide* note on page 48 *et seq.*

but when used for hides the product is not altogether satisfactory. It is essentially a rapid tanning material and the leather produced is light, lacking in durability and easily affected by water.

(2) **Cassia Fistula** (*Tam.* Kone; *Tel.* Rela; *Hind.* Amaltas. Konnai or Rela, otherwise known as the Indian Laburnum).—This tree is very abundant all over the Presidency and its bark is largely used by native tanners. It produces a dark-coloured leather and is inferior, in every respect, to No. 1.

(3) **Terminalia Chebula** (Myrabolams) (*Tam.* Kadukai; *Tel* Karakai; *Hind.* Hurrala).—This tree which is found all over India and Burma is by far the most valuable of all the Indian tannin-yielding trees. The bark contains a large percentage of tannin, but the unripe fruits are even richer and supply from 30 to 40 per cent. of pyrogallol tannin. Large quantities of myrabolams are used for finishing skins for export and they are valued at Rs. 15 to Rs. 20 a candy of 500 lbs. The best myrabolams come from the Salem District, but it is only from the northern ports on the Madras Coast that any are exported. It is not clear why this is so, as the trees are fairly abundant in many districts and the exports from Bombay are immensely more important than those from Madras. With alum myrabolams yield a yellow dye and with ferric salts they are largely used in the manufacture of ink.

(4) **Terminalia belerica** (*Tam.* Tani; *Tel.* Tandra).—The fruit is one of the myrabolams, but it is inferior to No. 3 and is barely worth the cost of collection and carriage. It is occasionally exported to Europe and is probably used chiefly as an adulterant of ground myrabolams.

(5) **Terminalia Tomentosa** (*Tam.* Karramarda; *Tel.* Nallamaddi; *Hind.* Sain).—The bark of this tree contains a considerable quantity of tannin, but in the Madras Presidency it is not used except by fishermen on the west coast for dyeing and tanning their nets. The Inspector-General of Forests selected the bark as a subject for investigation with a view to the use of its extract as a tanning agent, and his experiments have been successful in so far as they have demonstrated that extracts used for tanning can be easily prepared; but as yet, no practical result has been achieved, mainly, it is said, because of the high percentage of colouring matter and the large proportion of non-tanning soluble substances.

(6) **Casuarina Equisetifolia.**—Immense plantations of this well known tree exist on the coast sands near the sea, where it is largely grown by private individuals for firewood and by the Forest Department for the reclamation of sand dunes. The bark contains a considerable percentage of pyrogallol tannin and a red colouring matter which probably greatly discounts the value of the tannin it contains. Madras fishermen commonly dye their nets in a decoction of this bark.

(7) **Rhizophora Mucronata** (*Tam.* Kandal; *Tel* Uppupuma).—This is the well-known mangrove which is found in abundance on the muddy shores of tidal creeks all round the coast of India. The bark contains a variable percentage of catechol tannin. Attempts have been made to prepare extracts but without much success. Hooper states that considerable quantities of the bark are exported

from the swamps that line the Perak coast; but in the Madras Presidency nothing is done with it.

(8) **Cæsalpinia Coriaria** (Divi Divi).—This plant was introduced into India from the West Indies in 1834, and it has been grown with a fair amount of success all over the south of India. The tree yields pods which contain a very high percentage of tannin. Proctor, in 'The Principles of Leather Manufactures', writes as follows:—

"The dry pods contain 40 to 45 per cent. of pyrogallol tannin, mainly Ellagitannic acid and would be a most valuable tanning material but for a liability to fermentation and sudden development of a deep red colouring matter. The causes are not well understood but apparently the risk can be materially lessened by the use of antiseptics. If used in strong liquors it gives a heavy firm leather but is principally employed as a partial substitute for gambier on dressing leather. Used in rapid drum tannage for light leathers, an excellent colour may be obtained. It is said to give an especially firm and glossy flesh. Leather tanned with it, even when outwardly of good colour, has often a bluish violet shade within—perhaps due to the development of a colouring matter allied to that of logwood."

Mr. Thorpe at Podanur, contributed some notes to the *Madras Mail* in September 1888, recounting his experience with divi divi as a tanning agent. He noticed that it gives a white colour to leather. The extracted matter imparts a reddish brown colour to the material which in the finished state becomes excessively streaked. It also possesses the undesirable property of gallic fermentation to an extraordinary degree which is a source of loss and annoyance to the tanner. The fermentation takes place rapidly under an increase of temperature even in the presence of antiseptics. Leather tanned with divi divi is influenced by the weather, having the peculiarity of being soft and pliant in the wet weather and firm in the dry season. The Agricultural Ledger No. 10 of 1899 contains a summary of all the information at present available regarding the development of divi divi cultivation in India.

(9) **Acacia Arabica.**—The well-known babul tree (*Tam.* Karuvela; *Tel.* Tuma).—Babul bark is the common source of tannin over the greater part of India. But in the Madras Presidency, although available in large quantities, it is regarded as inferior to avaram bark and is consequently but little used. The Agricultural Ledger No. 2 of 1902 contains a large amount of information regarding the economic uses of this widely extended and valuable tree. The bark contains from 12 to 20 per cent. of catechol tannin with a good deal of red colouring matter, and the pods about the same percentage of pyrogallol tannin. The tannin of the babul pod, Proctor states to be "the only known tannin which gives no insoluble compound with lime" and this fact is borne out by its extensive employment in the north of India as a bate for removing the lime from skins and hides as a preliminary to immersion in the tanning pits.

(10) **Acacia catechu** (*Tam.* Karangalli; *Tel.* Nalla sandra; *Hind.* Jhair).—Gamble, in his 'Manual of Indian Timbers', states:

"The chief product of the tree is catechu an important catechol tan. In Northern India, under creful preparation, it is produced in the form of 'kath', a pale cinnamon-colored, biscuit like substance, which is valued as an astringent for chewing the betel and fetches a comparatively high price. This substance is found to be best given by those trees that have much white substance in the pores of the wood and is obtained by cutting

the wood into chips and then by placing these chips inside a boiler with water below. As the water boils the steam passes through the chips and extracts the kath which is taken off as a sediment and dried. In Burma and in other parts of India the product of the tree is "cutch" which is a black shining extract soluble in water and used as a tanning material and exported to Europe for that purpose."

The method of preparation of cutch or catechu is given in detail in the South Canara District Manual, from which the following extract is taken :—

"The catechu trees are felled, and their branches and sapwood removed. The heart wood is then chopped into small chips about 1½ inches by 1 inch in size. About 2½ maunds of chips are put into an earthen pot containing a maund of water and boiled for two hours. When the active principle of catechu has separated from the chips, the decoction is strained into a trough placed at the foot of the still and immediately transferred to another vessel of which about half a dozen are placed on the ovens in a line. The chips once boiled are again mixed with the same quantity of water and again boiled. The process of boiling and straining is repeated six times and at every time the decoction obtained is strained and transferred to the pot containing the former decoction. The decoction is itself boiled again for about six or seven hours until it attains a dark brown colour and becomes gummy. It is then discharged into an open, shallow vessel and stirred by a ladle until it becomes semi-solid by oxidation, which it does in about five or six hours. It is made into balls, each of 1½ inches in diameter and the balls are rolled in ashes. The above preparation is said to produce 45 balls weighing 10½ lbs Here ends the work of the people—males and females of the Kudubi caste—engaged for the purpose. After receiving the balls from the Kudubis the contractor has to go through a further process of rubbing them five or six times for two or three days, heaping them up in an airtight covering of ashes, in which state they are kept for three or four days, and then giving them another rubbing, after which they are spread out in the shade to dry; when dried the above 45 balls weigh about 9 lbs. The balls thus prepared are delivered over by the contractor to the Forest Department, which pays him the price agreed upon, viz., Rs. 60 per candy, about 3,000 balls making a candy.

"The manufacture of catechu is carried on from about the end of December to the middle of March It is confined to a jungle tribe. called 'Kudubis' who speak a dialect of Konkani and are said to have migrated into the district from Goa when it came under the sway of the Portuguese in the sixteenth century. When the Kudubi is engaged in the manufacture of catechu, he makes the site of the stills his home, the Kudubi woman being as much essential to the work as the Kudubi man. The work of the male ends when the has felled the trees and cut the heartwood into chips; all the rest of the process until the catechu balls are delivered to the contractor falling to the share of the female. The Kudubi gets from Re. 1 to Rs. 1-4-0 for every 100 balls manufactured or Rs 40 to Rs. 50 for every 4,000 balls which is generally the unit of account between the contractor and the Kudubi. During the three years ending with the 31st March 1894, about 49 tons of catechu were manufactured at a cost of Rs. 11,630 and the sale of these realised Rs. 25,857, leaving a total profit of Rs. 14,227 or Rs. 4,742 per annum to the Forest department. The manufacture of catechu gives employment to nearly fifty or sixty families of Kudubis, and the average monthly income of a family amounts to about Rs. 8.

"The catechu manufactured in South Canara appears to command a higher price than the product of Mysore on account of the careful and neat method employed by the Forest department in its preparation, the former

fetches Rs. 135 per candy, while the latter scarcely realizes more than Rs. 100. The catechu manufactured in South Canara is chiefly sold in Mysore where it is eaten with *pan* (betel leaf) and administered as a medicine to women immediately after confinement."

(11) **Acacia dealbata** (silver wattle); (12) **Acacia melanoxylon** (black wattle); (13) **Acacia decurrens** (common wattle).—These indigenous Australian acacias were introduced on the Nilgiris about 1840 and have completely naturalised themselves.

Of the silver wattle, Gamble writes, that "it has been tried in many places in India and has succeeded fairly in some localities in the Himalaya, but nowhere as it as on the Nilgiris, where it has not only completely naturalised itself, but it possesses a power of spreading which might cause it, if not checked, to become a serious nuisance"; and of the black wattle, "this large and handsome tree is now a characteristic feature in the landscape at Ootacamund, Coonoor and Newera Eliya. It is easily raised and grown from seed artificially but bad naturally. The trees on the Nilgiris are very liable to be attacked by a species of *loranthus* which parasites in time kill their host." Again, of the common wattle: "This tree resembles much the 'silver wattle' but is not so grey, and it is not so common on the Nilgiris but is perhaps more common in other localities, as on the Himalayas. It is the principal one whose bark is used for tanning, though not the best. There can be but little doubt that the capabilities of the Nilgiris in exporting either harvested wattle bark for tanning or tanning extracts have not been appreciated as they should. In Northern India the search for marketable tans of regular supply has been prosecuted with energy for some time, but nothing seems to have been done on the Nilgiris where the wattle is a 'weed' and miles of it can be grown at a very small cost and cut over for bark on a five years' rotation."

Hooper state that the following results were obtained in analysing the barks of Nilgiri-grown acacias :—

Acacia decurrens	..	.. 33·4 per cent. of tannin.
Acacia memoxylon	..	.. 28·6 ,, ,,
Acacia dealbata..	..	.. 17·8 ,, ,,

CHAPTER V.

MADRAS TANNERIES.

The equipment of a Madras tannery, owing to the entire absence of machinery, is of the simplest possible nature and can be described in a very few words. The only factors of any importance in determining the site are, first, an abundant supply of suitable water; and secondly, the possibility of getting enough labour in the immediate locality to carry on the various operations of the business. Native tanners attach great importance to the water-supply and there is not the least doubt that they are correct, although it is difficult to say why, with one water, perfectly satisfactory results are obtained whilst with

another good work can never be done. The water of Madras tanneries has never been analysed or subjected to scientific investigation and the causes which produce often very anomalous results are entirely unknown. The water is invariably drawn from surface wells sunk to a depth of from 20 to 40 feet and such wells are always in the immediate neighbourhood of the tanyard so that the water is almost certain to be highly contaminated with organic matter. One well-known tanyard, whose brand has a very high reputation on the London market, draws its water-supply from a well close to a Paracheri and there is but little doubt that it is highly contaminated with sewage. The water is said to be specially good for removing the lime after the unhairing processes are completed; and it would seem as though the sewage contamination produced a natural bate. In certain places tanyards have been started and have done very well for a time but eventually the supply of water has changed in character and gradually increasing troubles on that account have finally led to the abandonment of the tanneries. In one instance brought to my notice, a very large tanyard in Coimbatore is sublet to three different tanners and each draws his supply of water from a different well. The wells are no great distance apart, but the water from one of them enjoys an extremely high reputation and the skins turned out in that part of the tanyard supplied by this well are invariably of much better quality than those which come from the other sections of the yard where the water-supply is from other wells. A careful chemical and bacteriological examination of the water-supply to tanneries might possibly yield valuable results and it is almost certain that remedies could be found for the defects. At different seasons of the year the quality of the water varies considerably and after the rains it is generally not so satisfactory as in the dry weather. In tanneries near the coast the annual range of the temperature of the water is between 70° F. and 90° F.; and up-country, at an elevation of from 1,000 to 3,000 feet above the sea, the conditions are slightly more favourable, as in the cold weather the temperature falls to between 50° F. and 60° F. These high temperatures are extremely favourable to the development of bacteria and the rapidity with which putrefactive changes take place renders the work of tanning in the Madras Presidency one of extreme difficulty; and it is not surprising that the quality of the outturn varies enormously. Probably a good deal could be done by the intelligent use of disinfectants and sterilizers but it is more than doubtful if the extra cost which their employment would entail would be recouped. The Indian tanner knows the practical side of his business remarkably well and there is no doubt he often works at a profit where more scientifically trained tanners can only carry on operations at a loss.

A typical Madras tannery consists of tiled sheds built on the four sides of a square or rectangle with a blank wall externally and opening on the inside to a quadrangle. A wide doorway in the middle of one of the shorter sides of rectangle gives access to the tannery. One half is devoted to the reception of the raw materials and to the carrying out of the processes preliminary to tanning. The soaking pits are usually constructed below the ground-level along the outer walls. They are generally square in plan and three or four feet deep, built of brick and

plastered. For the removal of the lime after unhairing, tanks of brick and plaster are usually built above the ground level with masonry aqueducts or channels to supply them with water. Skin tanning is invariably carried on in wooden tubs from 3 to 4 feet in diameter or more, and of about the same depth. Of these there are often more than one hundred.

In well arranged tanneries the coolies engaged in the preparatory processes are not allowed among the tanning tubs so as to avoid the risk of lime being carried over.

Hide tanneries are generally much smaller than those devoted to skins, but the arrangements are otherwise very much the same except that the tanning is often carried on in pits similar to lime pits. The capital outlay involved in setting up a tannery even of the largest kind is not much and there are numerous small tanneries in which a few hundred rupees would probably cover the whole cost. As a natural consequence the work is carried on in tanneries very irregularly, all the more so as the tanners themselves have very little capital and are almost entirely dependent upon advances wherewith to buy skins or hides and carry on their business. In the past the profits of the Madras tanning trade were very considerable and this led to a reckless system of advancing money which naturally ended in heavy losses and during the last few years the system of financing the trade has materially improved An enormous number of small tanneries have shut up and the greater part of the trade is now carried on in the larger tanneries under more competent management. The tendency, of late, has also been for the European firms to withdraw from the business and it is now very largely financed by wealthy Muhammadans and Hindus.

Since 1898 the export of raw skins has seriously affected the volume of the business done in goat skins and it is impossible to foresee how the spread of chrome tanning in Europe and America will affect the industry in this country. The natural course of trade is influenced by the protective tariffs imposed on manufactured goods by America and all continental countries and the English market is at the present time the only one which is open to a free import trade of Madras tanned hides and skins. Everywhere raw skins are admitted free of duty but in America raw hides have to pay a 15 per cent. *ad valorem* duty which is imposed for the benefit of the stock-raisers in the Western and Southern States. Madras tanned sheep and goat skins are subjected to a 20 per cent. *ad valorem* duty. This was apparently of no great moment till the chrome processes came largely into vogue and so long as the fashion for chrome tanned leather prevails, the Indian tanners are helpless. The whole of the export trade of the Madras Presidency is in tanned hides and skins and not in finished leather. The hides are tanned but not curried, and the skins are tanned but not dressed. In the chrome processes for the manufacture of leather, it is essential that there should be no break of continuity in the process of converting the raw material into the finished product. Once chrome tanned leather is thoroughly dried, it is difficult to wet it again and the dyeing and finishing processes must, therefore, be carried on as soon as the tanning is completed. There is very little market in

India for high class leather or dressed skins and such demand as exists is supplied by imports from Europe. No great difficulty has been experienced in Bombay and Cawnpore in producing as good finished leather as can be obtained from the raw material available, but the supply is practically always greater than the demand and the industry is mainly dependent upon Government orders. If it were possible to find a market for finished leather or dressed skins, there is not the least doubt that it would have been done long ago; but the seeming want of enterprise on the part of those engaged in the trade in Madras is really due to a keen perception of the conditions of the industry. To curry leather or dress skins would never pay in Madras because owing to foreign protective tariffs it would be impossible to find a market for the finished material. It is an unfortunate fact that the Indian trade is at the mercy of foreign tariffs and it is doubtful if anything can be done to improve matters. The fiscal proposals which are now agitating the minds of statesmen throughout the British Empire may possibly effect some change for the better; but as yet, the part which India will be allowed to play has not been suggested, even in the faintest outline.

East Indian skins are an extremely important factor in the world's supply, but it is doubtful if they are sufficiently important to materially influence prices. The tanners of India would like to have an export duty on raw skins, but they are hardly likely to get it as India is not strong enough to force up the price so as to compel the importers in other countries to pay it. Even a comparatively small export duty will cause a great fall in the price of skins in this country and, though the tanners might gain, the stock owners would lose heavily. No charge of backwardness or want of enterprise can fairly be laid against the mercantile community in Madras engaged in the hide and skin trade, for the imperfect and unsatisfactory state of the tanning industry is due to causes entirely beyond their control.

CHAPTER VI.

TANNING.

The raw materials, whether skins or hides, are received at the tanneries mainly in a wet salted condition. In Madras and Bangalore, where a fair number of animals are killed in the slaughter-houses, certain tanners are able to procure a good supply of fresh hides and skins. Raw materials coming from other parts of India are received in the dry-salted or flint-dried condition. Skins, on receipt at the tannery, are carefully examined, and those suffering from serious defects are rejected and either disposed of to other tanners who make a business of tanning rejections or else tanned separately for special markets.

Fresh skins are simply washed in plenty of water to free them from blood and dirt and as soon as possible are put into the lime pits. Wet-salted skins are soaked in pits for about 12 hours to remove the salt and the water is changed from time to time so as to thoroughly remove all salt. Dry salted skins require a longer period of immersion to get

rid of all the salt and to restore the tissues to their natural state. Flint-dried skins are still more difficult to deal with as, owing to the complete desiccation of the pelt, water penetrates it very slowly and they often require mechanical treatment to thoroughly soften them. The practice of putting such skins into stale soaks is very unsatisfactory as although the softening action may take place more rapidly, putrefactive processes are set up and parts of the skin are often irretrievably damaged before the whole is thoroughly softened. In a hot climate like that prevalent in this Presidency, to avoid putrefactive changes, the period of soaking should be as brief as possible. Antiseptics are never used, probably on account of their cost, but it is by no means certain that they would not prevent a good deal of waste of substance which undoubtedly takes place in the soaking pits and would well pay for themselves in the improved condition in which the pelts would be when first placed in the limes.

It must be remembered that every process in a tannery contributes in some way or other to the quality of the final product and it is generally only when the final stages are reached that the results of defective treatment are apparent. It is, in consequence, often difficult to trace to its primary source an unsatisfactory result in the finished leather. Madras tanneries never attempt to produce sole leather and the great bulk of the lightly tanned hides which are exported are retanned for conversion into 'upper leathers.' Any criticism of the methods pursued by the Madras tanners must be entirely based upon commercial considerations and each process is to be considered suitable or otherwise in so far as it contributes to the production of a material which can be exported at a profit. In this connection, it may not be superfluous to point out that there is a vast difference between the quality of the hides and the quality of the skins with which the tanner has to deal. The former are undoubtedly inferior and, even though they were perfectly tanned, the final result could not be satisfactory in consequence of the inferiority of the raw material. On the other hand, the skins, to start with, are of excellent quality and well repay care and trouble in a tannery. The tanning of Madras hides is undoubtedly extremely defective and the final product is naturally of low quality, but it seems doubtful if any more profitable way can be devised for dealing with the great majority of the hides which are received in the tanneries. The general opinion of the experts, who purchase Madras tanned skins, is that the best of them are good enough for all practical purposes and it is doubtful if any changes in the methods of the tanneries would be productive of better results. All that is wanted is that the average work should be much nearer in quality to the best work and that there should be more care taken in grading the skins. Proctor, in his 'Principles of Leather Manufacture,' writes :—

"For some descriptions of hides, and notably for India kips, putrefactive soaks were formerly much employed, the putrefactive action softening and rendering soluble the hardened tissue. In India the native tanners soften their hides in very few hours by plunging them in putrid pools into which every description of tannery refuse is allowed to run. Putrefactive processes, however, are always dangerous, as the action, through changes of temperature or variation in the previous state of the liquor, is apt to be irregular and either to attack one portion of the hide before another, or to proceed faster than was expected. Hides are also frequently more or less

damaged by putrefaction and heating during the process of cure, and these damages are accentuated in putrid soak. Hence, hides in the soaks require constant and careful watching and the goods must be withdrawn as soon as they are thoroughly softened, for the putrefaction is constantly destroying as well as softening the hides. It is possible that putrefactive softening is less injurious to kips and such goods as are intended for 'upper leather' than to those for 'sole' purposes, as it is generally considered necessary in the former case that a good deal of albumen and inter-fibrillary matter be removed and that the fibre be well divided into its constituent fibrils for the sake of softness and pliability; and thus the putrid soak, if acting rightly, accomplishes part of the work which would otherwise have to be done by the lime and the bate as the actual fibre of the hide seems less readily putrescible than the softer cementing substance."

These remarks shed a good deal of light on the 'soaking' question and it is probable that the tanner dealing with cow hides for export is right in not using chemicals in the soaks; but with buffalo hides, which when tanned are in considerable local demand for sole leather purposes, it is possible that a serious initial mistake is made in not taking special precautions to prevent loss of gelatine at the very outset. Practical tanners in Madras have undoubtedly experimented in this direction, but their experiments have been carried out in an unscientific way and no record of the results has ever been made public. Although the tanning industry is one of the largest in the Presidency, there has never been any co-operation among the tanners to promote objects in which they are jointly interested; and a narrow-minded trade rivalry prevents one man from helping another and all from working for the common good. Individual tanners have told me of their experiments and of their failures, but no case has ever come to my notice of a well devised system of experiments which would have yielded a definite solution to any problem which required solution.

After soaking, as soon as the hides and skins have returned to the natural condition in which they were when removed from the carcasses of the animals, they are immersed in the lime vats for the purpose of loosening their hair. For the tanner's purpose, fat lime or that containing but a small proportion of silica and alumina is best. Round the city of Madras the tanners mainly use shell lime which is exceptionally pure and well suited to their purpose. After the lime stone or shells are burned the quicklime should be carefully hydrated by mixing it with as much water as it will enter into chemical combination with. Care should be taken that no nodules or lumps of unslaked lime remain. It may then be stored in heaps or in pits covered with matting to prevent the formation of carbonate of lime by the action of the air; and in this state will keep in good condition for an indefinite period. The quantity of lime used in the vats is not of much importance as the lime is only slightly soluble in water and as long as there is sufficient quantity an excess of lime is no great matter. The practice in most tanneries seems to be to use about a cubic foot of slaked lime for every 100 skins and for hides in about the same proportion. The skins are kept in the lime pits for about 8 days and are turned over every day so as to ensure that the lime water has free access to every part of the skin. Hides are very similarly treated and in about ten days are ready for unhairing. New limes are not nearly so rapid in their action as old limes, mainly because the

latter contain a large number of bacteria which assist in loosening the hair by their solvent action on the hair sheaths. The first liming process is complete as soon as the hair can be readily pushed off the skin with the thumb-nail. The unhairing is done on a sloping convex beam behind which the workman stands. The hide or skin is spread over the surface of the beam and with a slightly curved two-handled knife with a blunt edge, the workman scrapes off the hair with a firm downward stroke. The work requires a good deal of skill to accomplish it rapidly and without damage to the surface of the pelt. It is usually done by piecework and a trained cooly can do about 250 skins a day. The hair from hides and goat skins is sold for manure and usually fetches about Rs. 10 a ton. The wool from long-haired sheep is washed and dried, packed into bales and exported to England, where it is sold by auction and fetches about 3 annas a lb. After unhairing, the pelts are returned to fresh lime pits in which the skins are kept for 3 or 4 days and the hides for a longer period. This swells the pelt and makes it plump and firm and in a fit condition to be acted on by the tanning liquors.

Before immersion in the tan baths it is necessary, however, to get rid of all traces of lime and to clean the inner or flesh side of the skin by removing with a knife all fleshy and fatty matter. The fleshing is done on a beam similar to that used for unhairing, with a shorter and heavier knife the edge of which is kept sharp. The work requires great skill as the action is a cutting or shaving one rather than scraping; and carelessness in handling the knife would lead to cutting into the skin and probably irretrievable damage. Sheep and goat skin fleshings are of little value and are invariably sold for manure, but the hide fleshings are dried, squeezed into bales by hydraulic pressure and exported, chiefly to America for the manufacture of glue. After removal from the lime pits and before fleshing, the hides are generally thoroughly well washed in clean water and coolies get into the tanks and tread them well with their feet. This part of process has to be carried out very thoroughly if first-class work is to be turned out afterwards, and in the best tanneries and in yards where skins are pickled, great attention is paid to removal of the lime. After each washing the skins are scudded by being scraped with a blunt knife upon the beam, where by the lime and dirt still remaining in the pores of the skin are removed. In the process of unhairing it frequently happens that there is an undergrowth of short hair which it is difficult to remove with the blunt unhairing knife, and a sharp knife has to be used for the purpose. Even then, the last traces are difficult to get rid of and careful and frequent scudding are the most effective way of dealing with them. One of the greatest defects of Madras tanning is the fact that lime is frequently left in the skins to avoid the expense of removing it and to add weight to the finished product. Lime is not readily soluble in water and is removed with difficulty from the tissues of the pelt and it is usually the practice in most countries to employ chemical means for effecting it. In Madras practice, however, this is never done, while the system of bating prevalent in Northern India is not in use in Madras tanneries.

Since the American tanners discarded bark tanning in favour of chrome tanning for the production of glacé kid, not only have there

been extensive shipments of dry salted skins from Madras, but orders have been placed by certain American firms for large quantities of pickled skins. The process of pickling involves all the operations we have just described and, when these have been completed, instead of immersing the skins in the tanning tub, they are pickled in a liquor, the composition of which is kept a trade secret; but the secret apparently is one of little value and pickling formulæ are well known. The following extract from an American book entitled 'Practical Tanning' by Lewis A. Fleming, describes what, I believe, is practically carried out in Madras: "The liquor in which the skins are pickled is composed of water, sulphuric acid and salt. It should have a sharp sour taste with some flavour of salt. About two quarts of acid and 50 pounds of salt for 100 medium and large skins make a good liquor. Enough water should be used to cover the skins well and enable them to be stirred about without being crowded. They should remain in this liquor from two to four hours and should be stirred about. The effects of this process are to cleanse and bleach the skins and to put them into such condition that they may be kept for an indefinite time without spoiling." After removal from the pickling solution the skins are packed in barrels for export and the majority of them are sent to Boston, U.S.A. It would appear that American tanners do not regard pickled skins with much favour; and though some firms still use them the demand is not on the increase. The freight on pickled skins which have to be packed in barrels varies from Rs. 7 to Rs. 8 per 100 goat skins as against Rs. 3 to Rs. 4 for tanned skins and Rs. 4 to Rs. 5 for dry skins. The difference is not serious and there is no doubt that the skins can be unhaired and fleshed and got ready for tanning, cheaper in this country than in America. But the American chrome tanners find that they get better results when dealing with the skins from the very beginning on their own premises. Pickling solutions vary in composition very considerably, and it is apparently essential that the tanner should be accurately informed of the treatment which the pickled pelts have undergone. Chrome tanning is a purely chemical operation which is carrried out in a very short time and to secure the best results it is obvious that the exact chemical condition of the pickled pelts should be known so that composition of the chrome solutions may be adjusted to produce the best results.

Tanning.—It will be convenient to first deal with the treatment of skins. The practice with different tanners varies somewhat, and the following description is from notes made while inspecting tanneries devoted to the production of first-class work. The tanning solutions are invariably made from the bark of *Cassia auriculata*, of which about 250 lbs. are used for every 100 skins. At the Pitty Tannery in Madras which represents the highest level of tanning practice in this Presidency, the skins are kept in the first bath for six days and are then taken out and scudded. In the second bath sheep skins are kept for four days and goat skins for five days. Again they are subjected to beam work and in the third bath both kinds of skins are kept for four days. In most tanneries only two baths are employed and the period of immersion in each is usually eight days and only in the better class of tanneries are the skins scudded between the two baths. After

removal from the bark solutions the skins are practically tanned throughout. But unless subjected to further treatment, they rapidly change their colour on exposure to sunlight, and to prevent this occurring, they are treated for two to three days in a bath of myrabolams, of which about 50 lbs. are used for every 100 skins. This completes the tannage and the skins are now of a very light colour, almost white, which they retain permanently. On withdrawal from the myrabolams the skins are allowed to remain in heaps and then subjected to a final scudding process which removes the greater part of the moisture remaining in them. They are next lightly oiled with gingelly oil on the flesh side; and in good practice, about one pound of oil is used for every 10 skins; but in low class work, the skins are loaded with as much oil as they can carry, so as to increase their weight, and this over-oiling is regarded on the London market as one of the most serious defects of Madras tanning. The native tanner, however, looks at it in this light,—that skins fetch a very much higher price per pound than the cost of the gingelly oil and, therefore, the more oil he can get his skins to carry, the greater profit will he reap; and it is difficult to persuade him that in the long run the practice of over-oiling seriously diminishes the prospects of profit. The oiled skins are hung up in covered sheds for 24 hours to dry and are then spread over a wooden table and the grain side worked with a brass sleeker so as to smooth out wrinkles and stretch the skin uniformly in all directions. The skins are still harsh and stiff and to soften them they are staked. The stake consists of a broad steel blade fixed into an upright post about 2 feet above the ground and the skins are drawn across this blade, the cooly throwing as much of his weight as he can on to the skins. This makes the leather soft and pliable. Finally the skins are spread on a table with the grain side down and the flesh side is scraped or shaved and smoothed by rubbing with a rough brick.

Hide tanning.—The fleshed hides are put into tubs with layers of avaram bark between them and kept in a solution for three days, after which they are cleaned on the flesh side and then replaced for about five days in the same solution. From this they are removed to tubs containing a stronger solution of the bark in which they are immersed for about 10 or 12 days; afterwards they are treated for three days in a bath of myrabolams just in the same way as skins. On removal from the myrabolams the hides are hung up to dry and those for local use are well rubbed on the grain side with gingelly oil. Hides intended for export are further dressed on the flesh side with a mixture of tallow and cheap American flour with the object of preserving them and giving them a good appearance. In the matter of finally dressing, the practice, however, varies considerably in different parts of the country. Pallávaram and Coast hides are dressed with gingelly oil and rice cunjee, while Ránipéttai hides are not touched on the flesh side at all.

CHAPTER VII.

LEATHER MANUFACTURES.

It does not fall within the province of this monograph to trace the subsequent history of the hides and skins which are exported from this Presidency in a half manufactured state. Hides are largely sent Home in execution of orders, the balance are sold by auction. Skins are mainly disposed of at the London auction sales. Prices vary very much from time to time, but over a long range of years there has been a steady upward tendency. Cow hides of from fair to good quality are worth from 11¾*d*. to 14*d*. per lb. Light hides fetch higher prices than heavy, and calf skins most of all; the present price of the latter ranging from 17*d*. to 19*d*. per lb. Buffalo hides fetch from 9*d*. to 10*d*. a lb. The market classifications of skins are very numerous and the prices vary accordingly. Heavy skins have a much lower value per pound than light skins. Firsts are much higher in value than seconds and thirds. Sheep skins are usually cheaper than goat skins, but occasionally the reverse is the case. Madras prime tannages fetch the highest price, followed very closely by those of Dindigul, Trichinopoly and Coimbatore. Skins with a weight of 10 lbs. per dozen fetch about 3*s*. 6*d*. per pound on an average, whilst up-country tannages of the same description are not worth more than 2*s*. 6*d*. per pound.

Manufacture of Leather goods.—The only large leather factory in the Madras Presidency is the Government Harness and Saddlery Workshops in the Perambur Barracks. Captain Vanderzee, R.A., the Ordnance Officer in charge, has been good enough to furnish me with the following note:—

"GOVERNMENT HARNESS AND SADDLERY WORKSHOPS, PERAMBUR BARRACKS, MADRAS.

"This establishment was started in the year 1898; previously all harness, saddlery and accoutrements were manufactured in the Madras Arsenal, but owing to increasing demands for equipment and want of accommodation in the Arsenal, the Government Harness and Saddlery Workshops were started in the old buildings of the Government Gun Powder Factory at Vesarpaudy; this establishment is entirely distinct from the Arsenal, and like all the Indian Ordnance factories is directly under the orders of the Director-General of Ordnance, Simla. There is a permanent European establishment of two officers, a Head Overseer, four Warrant Officers, four Soldier Mechanics, a Civilian Foreman, a Civilian Cutter and a Gate-keeper. The officers themselves have to undergo a special training in the manufacture of leather, and the Head Overseer and Warrant Officers are men selected especially for the work they have to do. The Soldier Mechanics are all thoroughly qualified Saddlers and Collar-makers, and have all served as such for several years in their regiments or batteries before being appointed to the Ordnance Department. The Civilian Foreman is a man who has had a number of years experience in one of the largest firms at Home for the maufacture of harness furniture. The average number of native workmen employed daily is between 700 and 800; of this number about 400 are

leather workers, over 300 are metal workers (forgers, moulders, brass and iron filers) and carpenters, and the rest peons and coolies. Practically all the mountings used for the harness and saddlery and accoutrements manufactured here are made on the spot.

"2. The total quantity of leather used is on the average annually about 310,000 lbs. of all sorts; of this about 270,000 lbs. is buffalo, 30,000 lbs. cow, 2,000 lbs. goat and sheep, and 8,000 lbs. buff. Buff leather is obtained from England, and all the other descriptions of leather from a Government contractor by name Adamjee Peerbhoy, who has a large factory at Sion close to Bombay, which is under Government supervision, and where the tanning and currying of leather for Government is carried out on the Home principles.

"3. Only Government work is allowed to be done in this establishment, and this consists of—

"The harness and saddlery for Horse, Field and Heavy Artillery, Mountain Artillery, British and Native Cavalry Regiments, all Pack Transport Equipment for the Supply and Transport Corps, Accoutrements for British and Native Infantry Regiments and Volunteer Corps, all leather work for Field Gun Carriages, all Gymnasia Stores and Miscellaneous Equipment.

"4. The leather is received in various forms, but the bulk of it is buffalo tanned and curried; buffalo tanned butt or sole leather is also received for manufacture of saddle seats, scabbards, etc.; cow tanned curried, for certain accoutrements such as Staff Sergeants' belts, Native officers' accoutrements, Sam Browne belts and for bandoliers, linings of horse collars, wallets, etc.; buffalo skirting, for flaps of saddles and certain scabbards; bellows for manufacture of bellows; engine hose, for manufacture of fire engine hose; black waxed leather, for manufacture of black accoutrements; goat and sheep skins, for linings of pannels, bellows, fencing jackets, etc.; buff leather, for buff accoutrements.

"5. The following arsenals are dependent on this establishment for supply of harness and saddlery, accoutrements, etc.

Bombay Command.

Bombay, Karachi, Mhow and Quetta Arsenals.

Madras Command.

Madras Arsenal, Trimulgherry Depot.

Burma Command.

Rangoon Arsenal, Mandalay Depot.

"So that, all the accoutrements, harness and saddlery, etc., supplied to the British and Native troops in the Madras, Bombay and Burma Commands are manufactured here.

"6. The value of the outturn averages nearly 7 lakhs of rupees annually."

"So far as the tanning trade in Madras is concerned, it is extremely unfortunate that the proposals for establishing a Government tannery in Madras should have fallen through. The project was actually sanctioned and so far put into execution that some machinery arrived in Madras; and for years the glacis of Fort St. George was adorned with two long Cornish, boilers painted red. It is not quite clear why the scheme was abandoned. Apparently it was thought that Bombay

was a better centre for collecting a good supply of raw buffalo hides and no doubt the large slaughter-houses of that city yield a better class of hide than is ordinarily obtainable in Madras. But the quantity of leather required by Government is comparatively small and there should be no difficulty whatever in Madras in meeting the demand with hides of first-class quality. The manufacture of sole leather and the introduction of a proper currying establishment would undoubtedly have influenced local tanners, and might have led to considerable improvements in the tanning of hides.

The number of native leather workers employed is, as will be seen by a reference to the figures given in chapter II, very large, but practically, every family works for itself and there are no native firms or associations of leather-workers in the Presidency. Some of the large European firms in Madras manufacture saddlery, boots and shoes, but all the leather they use is said to be imported from England, and is either imported from England or brought down from Cawnpore. Cawnpore leather is of excellent quality and it would require expert knowledge to detect the difference. Quite recently, a fairly large boot and shoe factory has been established at Coimbatore by some Eurasian tanners who are trading under the name of Clifton and Company. Most of their work is done with country leather which they tan and curry themselves; and as the managers of the business have acquired a practical knowledge of the trade in England, they are able to turn out very excellent leather.

The output of the chuckler is very varied. Under skilled supervision and supplied with good materials, he turns out excellent work. Boots and shoes, harness and saddlery, can be obtained in Madras, of local manufacture but of imported material as well made, in respect to finished appearance and durability, as one could wish for. But beyond the influence of European ideas in regard to the appearance of things, the work done by the native chuckler is rough and clumsy, and there are no leather workers in this Presidency whose productions have at any time reached a standard of excellence in the least degree approaching that which is comparatively common among metal and wood workers. The reason, no doubt, is the extreme inferiority of the raw material and the uselessness of expending labour in the decoration of articles which must necessarily be of an ephemeral character. Excluding agricultural implements, the most commonly manufactured articles are sandals and shoes. These are made almost everywhere but in certain places the trade is more highly developed than in others. Muhammadans seem to indulge in the most expensive footwear and very elaborate specimens costing as much as Rs. 6 each have been sent me from Nagore near Negapatam. These are known as *chadas* and the more they creak the better they are liked. The soles are of buffalo hide very thick and stiff, and with large heels, and the various thicknesses are sewn together with hanks of cotton. The uppers are made of dressed sheep skins dyed red and ornamented with patterns sewn on them in coloured cotton. The shoes are canoe-shaped, the toe portion being something like a Venetian gondola, and the sides at the heels curve upwards and outwards in local disregard of the anatomy of the foot. The shoes most commonly worn all over the country are made with comparatively light soles with the toes turned up and curled over and the heels turned down, giving the wearer at all times a very slipshod

appearance. Red leather is almost invariably employed and many crude devices for decorating it are adopted. The fashions of different centres vary considerably, as for instance, shoes made in Trichinopoly are rounded off in the front and brought up to a point, whilst a similar article produced in Anantapur has a perfectly square toe, fully 3½ inches broad. As a general rule, the feet of natives are larger than those of Europeans and the distinction becomes more marked when the comparatively light build of the former is taken into account.

There is so very little fit about the ordinary shoe or sandal, which is commonly worn, that the luxury of the shoes made to order is practically unknown, and natives, as a rule, are content with anything that approximately fits them and which they can slip off and on with ease. The average price of native shoes is from Re. 1 to Rs. 2 a pair; but shoes are more or less a luxury and are only worn by comparatively wealthy people who are able to get about in carriages of some kind or other. Those whose have to walk about the roads sometimes wear shoes of inferior quality with thicker soles but the majority use sandals which are of much more substantial construction so far as the soles are concerned, and which cost from As. 12 to Rs. 1-8-0 a pair. Elaborately ornamented sandals of a much more expensive kind can be obtained and are used by richer classes. Native dress shoes are often very gorgeous and are very elaborately embroidered with gold, so that they are expensive articles and may cost as much as Rs. 50 or 60 a pair.

When the chuckler starts making shoes or sandals, he purchases the leather and skin which he requires in the bazaar and, taking it home, first proceeds with a preliminary currying operation. The leather is damped and well stretched and dyed with aniline, the usual colour being scarlet R.R. of the Badiche Aniline Soda Fabrick. This is purchased in the bazaar in packets and is dissolved in water to which a little oxalic acid has been added. The dye is applied with a piece of rag on the grain side and allowed to dry. After drying, tamarind paste is applied to the flesh side of the skin and the latter is then rolled between the hands so as to produce a coarse graining on the outer side. In making the shoes, the leather is usually wetted and moulded into shape on wooden moulds or lasts. As a rule, nothing but cotton is used for sewing and the waxed ends of the English cobbler are entirely unknown.

The largest consumption of leather in this Presidency is for water bags or kavalais which are used for raising water from wells, and for oil and ghee pots, in which the liquids are transported from one place to another. Of irrigation wells there are in this Presidency more than 600,000 and though some of them are fitted with iron buckets, nearly all of them have leather bags with leather discharging trunks. The buckets hold from 10 to 50 gallons of water and are generally made from fairly well tanned cow hides, though for very large buckets buffalo hides are sometimes used. The bucket is roughly semi-cylindrical in shape and suspended from an iron ring. At the bottom is a hole about 8 inches in diameter which leads into the discharging pipe—a leather tube 5 or 6 feet long, the open end of which is attached to a rope. It is unnecessary to describe the working of the common mhote and it is now of more importance to emphasise the very hard treatment which the leather receives from the hands of the ryot. Alternately

wet and dry, and seldom or never greased, the leather perishes very rapidly; and where the bucket is in use every day its life is seldom more than six months and during the latter part of that time it requires frequent repair which is a source of much annoyance to the ryot, as he is entirely in the hands of the village chuckler; and the latter, knowing that his services are indispensable makes the most of the situation. It may be safely assumed, taking into account the fact that many of these *kavalais* are only used at intervals during the year, that on the average a new water bucket is required once a year at each well; and, allowing for wells fitted with iron buckets or other means of lifting water, it is probable that at least one million hides per annum are used for this purpose. The value of a tanned hide is from Rs. 3 to Rs. 4 and the kavalai complete in the hands of the ryot, usually costs him from Rs. 6 to Rs. 9. The expenditure, therefore, on water bags can hardly be less than 40 lakhs of rupees per annum.

The number of oil and ghee pots in use in the country is very large, but owing to the nature of their contents their life is a long one. The pots are generally approximately spherical in shape and closed by a wooden bung which fits into a short neck. The use of leather vessels for this purpose is however on the decline as it is found much cheaper and more convenient to store oil in the ubiquitous kerosine-oil tin and it is not improbable that eventually the industry will die out as it has done in other countries.

The range of work of the country chuckler is not very extensive. Besides leather straps for wooden sandals, he makes crude harness for the ryots' cattle, including leather collars from which numerous bells are frequently suspended, leather whips for the cattle drivers, ornamental fringes for the bull's forehead, bellows for the smith and small boxes for the barber, in which to carry his razors. In some places leather ropes are used for various purposes and it is customary to attach big coir ropes to the bodies of the larger temple cars by leather harness when they are drawn in procession through the streets of the town or village in which they are situated. Drumheads, tom-toms and similar abominations are made from raw hides by village Vettians and Chucklers. The drums are often very large and are transported upon the backs of elephants, horses, bulls and camels. For them raw hides are required but for the smaller instruments sheep skins are sufficient. The raw hides are shaved on the flesh side and are then dried. The hair is removed by rubbing with wood ashes. The use of lime in unhairing is not permissible as it materially decreases the elasticity of the parchment.

The following information furnished by Mr. S. Vaidyanadha Aiyar, the Head Master of the School of Commerce, Calicut, gives some details regarding leather work in Malabar, and should be taken as typical of the information which can be collected for each district:—

"ITEMS OF LEATHER WORK MADE BY THE CHUCKLERS AND MAPPILLAS WHO ENGAGE IN THE TRADE.

" (a) *Boots and shoes of country make and English pattern.*
" (b) *Harness making.*

"(c) *Repair work.*

"(d) *Native shoes* (*ceruppus*).—These are of the special pattern peculiar to Malabar; and are largely used by all classes of the Hindu and Mappilla communities. The Arabs who visit this coast once a year purchase a considerable number to take back with them. The price of a pair varies from Rs. 1–8–0 to Rs. 5. Those with ornamental gold lace work cost from Rs. 10 to Rs. 50. These shoes are generally used by well-to-do Mappillas. The white of the egg is used to give a creaking sound to the shoes. This work is mainly done by Thole-perunkollans and Mappillas, and the latter show more skill in finish and ornamental work.

"(e) *Knife-sheaths.*—Almost every Nair, Teeyar and Mappilla carries a knife about one foot in length, and there is a demand for these leather sheaths, the price of which varies from one anna to 8 annas. These are made by Panans as well as by Thole-perunkollans and Mappillas.

"(f) *Leather baskets* are also made and they are largely used as receptacles for carrying pepper, paddy and other grains.

"(g) *Winnowing fans.*—These are made of leather and are used in pepper and paddy yards in godowns.

"(h) *Muttu ceruppu* (*clogs*) are leather shoes with wooden soles. These are largely used during the rainy season and cost from As. 12 to Rs. 2."

CHAPTER VIII.

PROSPECTS OF THE TRADE.

In concluding this survey of the Madras tanning trade it seems desirable that some attempts should be made to depict the present condition of the industry and to indicate the general tendency of the forces which affect the tanner and leather-worker in the South of India. The position of the skin dealers and vendors of hides is a roseate one as the value of the raw commodities in which they deal is ever tending upwards. This is not due to any action on their part but simply to the fact that in the markets of the world the value of the raw material is steadily rising. It is impossible that they should influence matters much in any way but there is no doubt that they could do something to secure better qualities of hides and skins. If branding of cattle could in any way be discouraged it would add enormously to the value of the hides. But it is probably hopeless to expect that any material change in this direction will take place, and in fact the hides are deliberately ruined in order that they may insure the animals from greater dangers.

In connection with skins, what is most wanted is that more care should be taken in curing them immediately they have been taken off the animals. Putrefactive processes set up with such extreme rapidity in these hot climates that many skins are badly damaged through carelessness in this matter. Turning to the tanner, there is no doubt that the small man is in a bad way and there is a distinct tendency for the ryots to dispense with the services of the village tanner and to sell their skins or hides to dealers and to buy such articles of leather as are necessary in the bazaar. On the whole, this

must be regarded as a satisfactory result. The Chucklers and Madigas have now become agriculturalists and have given up their hereditary occupation of spoiling good material. It is distinctly advantageous to a country that its natural resources should be used in the best possible way and there is no doubt that throughout India the modern tendencies of the trade in hides and skins are wholly favourable. The disturbing element in the tanning trade at the present time is the chrome process and till a final verdict has been pronounced upon the value of the peculiar properties of this leather, it is impossible to say what the future of the trade will be. It is certain that the present demand for raw goat skins will continue and that the best of them will be sent out of the country. But it is not improbable that the possibilities of utilising chromed goat skins have been fully developed and that therefore the present condition of things may continue for a considerable period provided that it is not disturbed by changes in the fiscal policy of the Nations who are engaged in this trade with India.

The position of India in regard to chrome tanning is described at some length in an article on 'Tanning in the Madras Presidency' which I lately contributed to the *Indian Review*, and from it I extract the following passages :—

"The cause of the demand for raw skins is entirely due to the popularity of a new kind of leather which is now largely produced in America and on the Continent by one or other of what are known as the chrome processes. Chrome tanning was first experimented with fully 50 years ago, but no great progress was made with it till within the last ten years and it was only in 1895, that chrome tanning was thoroughly established in America on a firm commercial basis. The process may be described as a purely chemical one requiring a considerable knowledge of chemistry and an accuracy in manipulation which can only be expected from specially-trained men.

"The product, chrome-tanned, or more properly speaking, 'tawed' leather is, in many respects superior to leather made by any other process and for certain purposes it has probably displaced vegetable tanned leathers permanently. Compared with other tannages, chrome produces a leather which, whilst exceedingly soft and pliable, possesses great strength and is practically unaffected by water. Moreover, it is less liable to stretch than other leathers and this important property makes it specially suitable for the manufacture of boots and shoes. Chrome tanned leather may be boiled for several minutes with impunity or exposed to strong heat for some time without risk of injury; and these valuable properties add greatly to its wearing qualities. Once chrome tanned leather is thoroughly dried, it is exceedingly difficult to wet it again and it is therefore necessary that the finishing process should be undertaken as soon after the tanning as possible. This is a matter of great importance to this Presidency because hitherto the tanners have not attempted to produce for the export trade anything more than half finished goods and it is practically impossible to introduce chrome tanning unless at the same time arrangements are made to complete the process of converting the skins into marketable articles. The opinion is almost universally held amongst those engaged in trade in Madras that it is impracticable to produce finished goods cheaply enough and at the same time of sufficiently good quality to enable them to be exported at a profit. Attempts have certainly been made both in Madras and Bombay and they have ended in failure.

"At any rate, there is no doubt that the successful establishment of an export trade in chrome leather from India can only be accomplished in the face of great difficulties which may be briefly classified under three heads:—

"(1) *Want of Capital.*—A chrome tannery with the accompanying leather dressing shops requires a large amount of machinery and apparently can only be successfully worked on an extremely large scale. In America one firm is said to be capable of turning out 3,000 dozen finished skins a day and another to have a capacity of fully 2,500 dozen skins, so that these two firms alone could easily deal with all the exports of this Presidency. Of course it will not be necessary to establish tanneries in this country on that gigantic scale; but it will be necessary to invest a large amount of capital with dubious prospects of success and under such circumstances it is quite hopeless to think that the capital will be forthcoming.

"(2) *Want of intelligent labour.*—The modern tannery very largely employs machinery in all its processes in place of hand labour. In India, undoubtedly, so much machinery would not be of any advantage provided that skilled hand labour were available at reasonable rates. For certain kinds of work machines are absolutely essential as they turn out work far better and far cheaper than any hand labour can possibly do. But, on the other hand, in countries like America where labour is expensive, machines often supersede hand labour with a very much narrower margin of advantage and when those machines are introduced into Eastern countries where labour is cheap, the advantages, derived from their employment entirely disappear. It would therefore seem probable that a judicious combination of machinery and hand labour would enable tanning and leather dressing to be carried on with advantage; but the difficulty is to obtain a sufficient amount of skilled hand labour. Only the very lowest castes will do manual work in a tannery and even they, as a rule, only take it up when they cannot obtain employment elsewhere. At the present time the general complaint of Madras tanners is that labour is very scarce owing to the fact that the season has been a good one and there is plenty of agriculturul work to be obtained. In bad seasons labour is plentiful but at other times it is insufficient. Practically, tanning is monopolised by poor Muhamadans and Pariahs and if any improvements are to be introduced or changes made, either these people must be educated and their intelligence developed, or a supply of labour must be obtained from other sources; neither of which alternatives seems practicable on a large scale at the present time.

"(3) The third cause which it is said would prevent successful chrome tanning in this country is the hot climate. But the evidence offered in favour of this statement is, by no means, conclusive. So far as I have been able to ascertain it is entirely based upon the fact that in America chrome tanners find it difficult to secure uniform results in the hot weather and they have had to either give up work or use artificial means for cooling their solutions. This may be perfectly true in the huge American tanneries and with the methods of working there employed, and yet have no bearing whatever upon the conditions which prevail in this country. In a small way, chrome tanned leather has been produced in India and the failure to turn out a marketable article seems to be due to defects in finishing rather than to anything wrong in the tanning.

"Even supposing that all these difficulties were successfully overcome, there yet remains the difficulty of finding a market for the finished skins. It is absolutely certain that the tariffs imposed by continental nations and by America, if not already sufficiently high to exclude Indian manufactured leather, will be immediately raised so as to prevent the possibility of finding a market in any of these countries. The only open market is in London which is already fully supplied and competition is

practically impossible so long as foreign nations can ship their surplus productions for disposal there, at any price they will fetch. There only remains the local market in India and that at the present time is too insignificant to be of any account though, as we shall presently see, it is in the development of the home market that the most promising results may be expected.

"The export of raw skins from Madras which commenced in May 1899 is a matter of such great importance to this Presidency that it seems desirable to bring together all the statistics available and these are summarised in the following table, in which the numbers given relate to bales and in the case of pickled skins to casks :—

Year.	Tanned goat skins.	Tanned sheep skins.	Raw goat skins.	Raw sheep skins.	Pickled skins.
1898	21,417	7,633	*Nil.*	*Nil.*	*Nil.*
1899	19,903	8,042	996	...	2,347
1900	19,986	10,457	3,397	257	1,730
1901	12,135	9,501	6,507	404	4,312
1902	12,982	8,173	5,732	280	1,540
1903 till 1st September			1,752	203	1,334

"From this table it will be seen that so far chrome tanning has only affected the goat skin trade as the export of tanned sheep skins and tanned hides of all classes still remains about the same. The various brands of Madras skins are well known in the London market and all the prime tannages, especially those prepared from slaughter-house pelts, have a high reputation and command good prices. They are chiefly used for expensive book-binding and fancy leather work; and, although the Committee appointed by the Society of Arts to report upon the deterioration of leather used in book-binding pronounced a very unfavourable verdict upon East Indian skins, yet it is unlikely that chrome tanning will in any way affect the demand for these skins, as chrome tanned leather is unsuitable for conversion into highly priced fancy leathers. The great bulk of the trade, however, is in what is known as 'up-country tannages' and as these will only take a black dye they are almost entirely employed in the boot and shoe trade and here they come into competition directly with chrome tanned skins. It has been established beyond doubt that chrome tanning produces a superior leather and it is therefore merely a matter of time before the whole of the trade in tanned goat skins except those of superior quality will disappear. So far, only trial consignments of raw sheep skins have been sent to America, and as there is a much greater difference between the freight on tanned sheep skins and dry sheep skins than there is between tanned and raw goat skins, and as the value of sheep skins is only about one-half that of goat skins, the margin to cover the cost of tanning in America is much smaller and it is therefore probable that Madras tanned sheep skins will still continue to hold their own in foreign markets . . . ."

It seems to me, then, that any efforts to improve tanning in the south of India should first be directed to improving the supply of leather for local consumption. I propose now to only deal with one class of leather goods which are in very large demand, namely, buckets

for lifting water from wells. Probably not far short of a million hides are used every year for these articles alone Generally, they are good hides which would command ready sale if they were available for export. The life of a leather bucket at a well is not a very long one and if the bucket is in use every day does not average much more than six months and probably all through the Presidency it is always necessary to provide a new bucket for each water-lift, once a year. The buckets are made of well-tanned leather, but constant immersion in water and exposure to a hot sun cause them to deteriorate very rapidly and they are a constant source of trouble and annoyance to the ryots.

The introduction of chrome tanned leather for these buckets promises to be a great improvement and at the risk of repeating what I have already said, I propose to quote, from 'The Manufacture of Leather' by Mr. C. T. Davis, a paragraph in which he describes the characteristics of chrome leather. He says:

"Chrome leather has special and peculiar qualities which distinguish it from all other kinds of leather and these special features cause it to be a superior fabric for all the purposes for which leather is used. It has often been stated that chrome leather is water-proof. but this is not a proper term to use in connection with it: it should more properly be called non-absorbent. All kinds of leather produced with tannin absorb water readily, like a sponge, while chrome leather does not absorb water but resists it or sheds it, like the feathers of a duck. In fact it is a difficult matter to thoroughly wet chrome leather when it is once dry. Again, water and air are the agencies in nature which promote decomposition and decay, and as tannin and hide substance are both organic materials, and when combined, as is the case in bark tanned leather, and subjected to the process of wetting and drying, such leather will, eventually but surely, deteriorate and become rotten. Chrome leather, on the other hand, being a combination of an inorganic material with the hide substance and subjected to the same process of wetting and drying shows no effect whatever. In fact, the oftener chrome leather is wet and dried, the softer and more flexible it becomes. Even subjecting it to boiling water apparently has no effect upon it while any sort of leather produced with tannin and placed in boiling water is utterly destroyed. Moreover, chrome leather is of much lighter weight than bark leather and this is a decided advantage for almost all purposes for which leather is used."

Accepting this as a fair statement of the properties of chrome leather, it is evident that as compared with bark tanned leather it is an almost ideal substance for water bags. Chrome tanning must be introduced, or eventually, our tanning trade will largely disappear, and as we have already seen that it is practically hopeless at the present time to try and manufacture finished leathers suitable for foreign markets, it seems to me that we might well commence by endeavouring to turn out a chrome leather suitable for these water bags. The chrome leather, at first, might not be of the highest possible quality but it would be so much better than the leather in use at the present time that it ought to find a ready sale even at considerably enhanced prices. In this Presidency where tanning materials can be procured at extremely low prices and where the chemicals used in chrome tanning will have to be imported, it is probable that the cost of chrome tanning will always be somewhat greater than that of the tanning now in vogue. But if the material turned out is much superior

and more durable, this is not likely to prove a great difficulty in the way of making chrome tanning a success. From the very outset it should be possible to produce marketable goods and in course of time, as experience accumulates, the quality may improve and ultimately it may be found possible to manufacture leather of sufficiently high quality to enable it to be used for many other purposes. As the first step therefore in any attempt to bring Madras tanning once more on a level with that of the rest of the world attention should be directed to the manufacture of goods for the local market and the manufacture of leather for water bags promises to yield the most successful results. The innate conservatism of the ryot may at first prejudice him against any new material, but he is so thoroughly well acquainted with the unsatisfactory character of the only leather he can at present obtain, that I do not anticipate that there will be much difficulty in getting him to use chrome tanned leather bags when their advantages have been satisfactorily demonstrated.

It would be possible to enumerate many other purposes for which chrome tanned leather might be used with advantage in this country, but at the outset I think it is desirable to limit the range of experiment as much as possible and the field opened out by the water bag industry is quite large enough to begin with. Chrome tanned water bags may reasonably be expected to last two or three times as long as the ordinary bark tanned bags now employed, and if they come into general use there is no doubt that the consumption of hides for water bags will be greatly reduced. This would mean a considerable saving to the ryots engaged in well cultivation, and would throw a large number of first-class hides on the market for export and will probably increase the external trade of the country by an amount which may be vaguely estimated at something over ten lakhs of rupees per annum.

In other directions it does not seem likely that much can be done to improve the prospects of the tanning trade in this Presidency. The opinion is strongly held, and rightly so I think, that the best Madras bark tanning of skins is capable of little or no improvement, but much might be done to raise the quality of the up-country tannages, which are at present over-limed and far too heavily weighted with oil. Sole-leather is not produced in the Madras Presidency but large quantities are made in Bombay and Cawnpore and there appears to be no reason why a thoroughly satisfactory material should not be produced in Madras. In fact on what is practically an experimental scale it is so produced and it only requires energy in finding markets for it to establish a fair business.

Allusion has already been made in chapter IV to the possibilities of increased trade in the raw tanstuffs which abound in this Presidency and in referring to them again, attention is directed to the reports which have been published in the Agricultural Ledger No. 9 of 1899 on the tannin yielded by *Cæsalpinia digynia*, the cultivation of which in suitable localities will probably be more profitable than that of the allied species *Cæsalpinia coriaria* (Divi-divi) with which experiments have frequently been made.

The question has often been raised as to whether Government could materially assist the local tanning trade by providing means for the technical education of those engaged in it. There is no doubt that

much interesting work could be done by a scientifically trained tanner and it is possible that there might be some practical outcome from his work; but if he were placed at the head of a leather trade school similar to the well-known institutions at Leeds and Bermondsey, it is almost certain that he would get no *bonâ fide* students. The actual tanners of the Presidency are almost without exception, an illiterate class and any changes in the methods of tanning will have to be forced upon them. It is quite certain that they will never change of their own accord; and it is equally certain that they have no desire for, nor capacity to assimilate technical education. It must not, however, be imagined that the possibilities of improving the tanning trade have been neglected. The volume of the business is so large that it is keenly watched by experts all over the world and, except that they take no interest whatever in the local markets, one may rest fairly confident that nothing of importance has been overlooked and that the interests of India are not suffering, because the investigation of her resources in the tanning and leather industry is mainly in the hands of foreign experts.

16*th December* 1903. A. CHATTERTON.

ADDENDUM.

In the interval which has occurred since the preparation of the above monograph and the revision of the proofs for the press, the manufacture of chrome leather on an experimental scale has been successfully carried out in the School of Arts in Madras and a considerable number of hides have been tanned and converted into chrome leather. It was represented to the Madras Government that it was desirable that the experimental manufacture of chrome leather should be attempted, and a sum of Rs. 2,000 was placed at my disposal for that purpose. It is unnecessary to detail at length the various experiments which have been carried out, and it will suffice to say that most of the well-known methods have been tried and, as a result, it has been found that the following process yields chrome leather suitable for water bags and such class of work :

The hides are procured from local tanneries in a state ready for immersion in the tanning liquor, but special precautions have to be taken to secure complete removal of the lime after the unhairing and fleshing. Both fresh hides and pickled hides have been tried, and I am inclined to think that the pickled hides yield a rather better leather, but it is doubtful if the improved quality is worth the extra expense. The tanning solution consists of chrome alum dissolved in water and rendered as nearly neutral as possible with sodium carbonate. The addition of sodium carbonate produces a rapid effervescence of carbonic acid gas owing to the presence of free acid in the chrome alum, and some care is necessary to avoid adding more carbonate than is required to neutralise the acid as any excess produces a precipitate of chromic oxide which is useless for tanning purposes. A comparatively weak solution of the neutral chrome alum is put into a drum in which the tanning processes are carried on. From time to time the solution is strengthened, and as a rule it takes from 36 to 48 hours to complete the tannage of an average hide. This is ascertained by making a clean cut in a thick part of the hide, and the section exposed should be of a uniform blue colour throughout. The hides are then removed from the drum and piled in a heap for about 12 hours, so that the surplus tanning liquor may drain out of them. They are then washed in clean water and fat-liquored in a drum. A good deal of trouble was experienced in finding a suitable fat liquor, but after many experiments it was found that castor-oil made into an emulsion with a solution of carbonate of soda and mixed with water yielded the best results. No cheaper fat liquor could well be devised, and in a drum it was readily absorbed by the leather. On the completion of fat liquoring, the hides are hung up to dry for a time and then, whilst still moist, are sleeked on the grain side, then well staked and finally scoured on the flesh side. The resulting leather is very soft and of considerable tensile strength and so far as it has been tried within the time available, has proved perfectly satisfactory for water bags and water buckets.

The sale of the leather is making steady progress, and there seems to be little doubt that it is eminently suited for the purpose. The durability of the leather can only be tested by lapse of time, but so

far, everything points to our anticipation being realised in the fullest possible manner. The process of tanning is exceedingly simple, and there seems to be no reason why any native tanner should not be able to carry it out after receiving a short course of instruction. The chemicals employed are cheap and the actual cost of tanning does not exceed that of bark tanning.

There can be no doubt that the experiments have successfully demonstrated the possibility of chrome-tanning hides in Madras and of turning out a quality of leather eminently suited for water bags, and it simply remains to introduce these water bags to the notice of the ryots and demonstrate to them the advantages which they possess over the ordinary-bark tanned leather bags. This is a much more difficult matter and will surely take time, but it is certainly worth while persevering with, as the ultimate saving to the agricultural community will be very large. It will be necessary to give the hides tanned in the School of Arts at least a year's trial before any practical steps can be taken to establish tanneries in various parts of the country. It has accordingly been decided to continue manufacturing chrome leather at the school on a small scale for some time longer; but it is hoped that the tanners of the Presidency will soon take the matter up and relieve the Education Department of the necessity of entering into extensive manufacturing operations to demonstrate, on a commercial scale, the possibilities of a new process.

29*th March* 1904. A. CHATTERTON.